

# The Gracillariidae (Lepidoptera, Gracillarioidea) of the Galapagos Islands, Ecuador, with notes on some of their relatives

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**The Gracillariidae (Lepidoptera, Gracillarioidea) of the Galapagos Islands, Ecuador.** - Ten species of Gracillariidae (Lepidoptera, Gracillarioidea) have been found so far on the Galapagos Islands. In addition to *Phyllocnistis citrella* Stainton, reported elsewhere, nine new species or subspecies are described and illustrated: *Acrocercops serrigera galapagosensis* ssp. n. (reared from *Waltheria ovata* Cav., Sterculiaceae), *Caloptilia dondavis* sp. n. (reared from *Rhynchosia minima* (L.) DC., Leguminosae), *Caloptilia galacotra* sp. n., *Caloptilia cruzorum* sp. n. (reared from *Galactia* sp., Leguminosae), *Cryptolectica lazaroi* sp. n. (reared from *Synedrella nodiflora* (L.) Gartn. and *Ageratum conyzoides* L., Asteraceae), *Dialectica galapagosensis* sp. n. (reared from *Macraea laricifolia* Hook. f., Asteraceae), *Dialectica sanctaecrucis darwini* ssp. n., *Neurostrota magnifica* sp. n., and *Neurostrota brunnea* sp. n. A lectotype is designated for *Acrocercops serrigera* Meyrick.

**Keywords:** Micro moths, leaf miners, endemic species, taxonomy, Neotropical, Gracillariidae, Sterculiaceae, Leguminosae, Asteraceae.

## INTRODUCTION

Gracillariidae are often beautifully coloured micro moths with very slender wings and long antennae. The family is the largest of the plant mining Lepidoptera with 1806 species in some 99 genera distributed all over the World except Antarctica (De Prins & De Prins, 2005). The latest checklist for the Neotropical region includes 147 species in 19 genera (Davis & Miller, 1984); since then, only a few more gracillariid taxa have been described from the region (Davis, 1994; Davis & Wagner, 2005; Vargas & Landry, 2005; Vargas & Parra, 2005). The specialised larvae are known for their hypermetamorphic development during which they radically change shape and habits at least once.

Presumably because of their small size and feeding habits, gracillariids are not very abundant on oceanic islands. Even the Hawaiian Islands have only one endemic genus with 30 species (Zimmerman, 1978). The same characteristics also mean that they are likely to be endemic if they feed on endemic plants. However, some gracillariids have greatly benefited from our encroachment on native habitats and have

become widespread pests; an example is the citrus leaf-miner (*Phyllocnistis citrella* Stainton), discovered in the Galapagos in 2005 (Landry & Roque-Albelo, in press). Thus, mainly for conservation purposes the Gracillariidae of the Galapagos are described below.

Two of the new taxa described here are believed to represent new subspecies. This is a compromise between the observed differences and the lack of material of the nominal subspecies for comparison. With sufficient continental material for comparison, these new Galapagos subspecies may eventually prove to be valid species as was shown to be the case for the recently described geometrid *Eupithecia yubitzae* Vargas & Parra (2004) (type locality: Northern Chile, Arica Province), the cosmopterigid *Periploca otrebla* Vargas (2003) (type locality: Northern Chile, Azapa Valley), and the coleophorid *Coleophora darwini* Landry (2006) (type locality: Galapagos, Pinzon), for which small but consistent morphological differences were found in comparison with the Galapagos *Eupithecia galapagosata* Landry & Rindge (1995) and *Periploca longipennis* Landry (2001), and the continental *Coleophora intexta* Meyrick (1917) (type locality: Lima, Peru).

## MATERIAL AND METHODS

The material forming the base of this study, some 335 specimens altogether, was mostly collected by myself during five expeditions to the Galapagos in 1989, 1992, 2002, 2004, and 2005. The moths were collected at light, either with a mercury vapour light or an ultra-violet light suspended next to a white sheet or within a towerlike trap. The other specimens, some of them reared, were collected by Dr Lazaro Roque-Albelo and colleagues of the Charles Darwin Research Station, Santa Cruz Island, Galapagos (CDRS), and Patrick Schmitz, "Muséum d'histoire naturelle de Genève," Geneva, Switzerland (MHNG). No other public or private collection examined contained specimens of Gracillariidae collected in the Galapagos.

In order to recognise the Galapagos species as new, Don Davis of the National Museum of Natural History, Washington, D. C., U.S.A. (USNM) first identified each species to genus and compared the Galapagos species with the types of Neotropical species found in the USNM. I did the same with the types deposited in the Natural History Museum, London, England (BMNH) for Meyrick's, Walsingham's, and Zeller's species and in the Cornell University Insect Collection (CUIC) for Forbes' (1931) species. In the genera concerned here only three other species described by Bourquin (1961) had their types elsewhere, but their descriptions provided ample details for comparison. Later on in the project, when I discovered *Neurostrotia* species in the Galapagos, Don Davis and Kevin Tuck (BMNH) compared my species with similar taxa.

In listing the label data of the holotypes, I have copied the information as found on the labels with slashes to express changes of lines, and abbreviations spelled out in square brackets, except for distances. As regards the lists of paratypes or specimens examined, the specimens' data are listed first in alphabetical order of island collected and then in order of dates collected, the information is recorded without indications of line changes, the abbreviations, except for distances, "GPS" (= Global Positioning System), and cardinal points, are spelled out only once at first encounter, collecting

localities are reported without accented letters, dates are standardised, and collectors' information is standardised and placed in parentheses. For each species' holotype the data label is printed in black on white card stock while the holotype label is hand-written in black ink on red card stock. The order of the labels associated with BMNH type specimens in Figs 28-30 is clockwise from top left in sequence going down the pin. In addition to the acronyms mentioned above, the following is used: CNC for Canadian National Collection of Insects, Arachnids, and Nematodes (Ottawa, Ontario, Canada).

Genitalia were dissected after the abdomen was macerated in a cold 20% KOH solution overnight. The dissected parts were kept in lactic acid stained with orange G for description purposes. They were subsequently stained with chlorazol black and mounted on slides in Euparal. The forewing length and comparative length of the antenna were measured with a reticule on a stereomicroscope. The illustrations of the moths and genitalia were made with the AutoMontage® system using a JVC® video camera mounted on a Leica MZ APO stereomicroscope or a Zeiss Axioskop compound microscope. Colour drawings of the adults can be viewed on the web site of the MH-NG at [www.ville-ge.ch/musinfo/mhng/](http://www.ville-ge.ch/musinfo/mhng/).

The descriptions and nomenclature of parts are based on Davis & Robinson (1998). Generic characters are not repeated. In the legs, wings, and thorax only the lateral or dorsal exposed surfaces are described.

#### KEY TO THE SPECIES OF GRACILLARIIDAE OF THE GALAPAGOS

1. Forewing with some white markings . . . . . 2
- 1'. Forewing without white markings . . . . . 6
2. Forewing with white markings on costa and dorsal margin . . . . . 3
- 2'. Forewing without white markings on costa, with three white markings on dorsal margin (Fig. 8) . . . . . *Neurostrota magnifica* sp. n.
3. Forewing with entire dorsal margin white; ground colour blackish brown (Fig. 1) . . . . . *Acrocercops serrigera galapagosensis* ssp. n.
- 3'. Forewing white markings on dorsal margin interrupted; ground colour dark brown, chestnut brown, or orange brown . . . . . 4
4. Forewing ground colour chestnut brown; white markings as narrow bands and small spots (Fig. 5) . . . . . *Cryptoelectica lazaroi* sp. n.
- 4'. Forewing ground colour orange brown; white markings including two large triangles . . . . . 5
- 4''. Forewing ground colour dark brown; paler markings consisting of a longitudinal band along dorsal margin interrupted once postmedially, a narrow line from costa at 3/5, pointing obliquely towards apex, ending at 3/4 before midline, and a small costal spot at 4/5 (Fig. 9) . . . . . *Neurostrota brunnea* sp. n.
5. Apical 1/3 of forewing crossed by two transverse white bands (Fig. 6) . . . . . *Dialectica galapagosensis* sp. n.
- 5'. Apical 1/3 of forewing with one subterminal, transverse white band connected with a larger longitudinal band on the dorsal margin anteriorly (Fig. 7) . . . . . *Dialectica sanctaecrucis darwini* ssp. n.



6. Forewing ground colour mostly dark brown with purple lustre; costal half mostly paler, yellow, ochre, or beige, usually with larger pale patch between about 1/5 and 2/5; ventral margin of male valva with projection . . . . 7
- 6'. Forewing ground colour as above, with costal half paler, beige, but without larger pale patch before midlength (Fig. 3); ventral margin of valva without projection (Fig. 12) . . . . . *Caloptilia galacotra* sp. n.
7. Forewing paler costal half and larger antemedian patch yellow or ochre (Fig. 2), purple lustre on dark brown scales usually conspicuous; forewing length 2.5-3.9 mm; projection of ventral margin of valva without spines apically (Fig. 11) . . . . . *Caloptilia dondavisi* sp. n.
- 7'. Forewing paler costal half and larger antemedian patch (sometimes reduced), beige (Fig. 4), purple lustre on dark brown scales usually subtle; forewing length 3.9-4.8 mm; projection of ventral margin of valva with spines apically (Fig. 13) . . . . . *Caloptilia cruzorum* sp. n.

## SYSTEMATIC TREATMENT

### *Acrocercops* Wallengren, 1881

This is a large genus with 349 described species (De Prins & De Prins, 2005), including 65 in the Neotropical region (Davis & Miller, 1984). The host plants include a large number of dicotyledonous families, such as Asteraceae, Ericaceae, Fagaceae, Leguminosae, Malvaceae, Myrtaceae, Rosaceae, etc. (see Robinson *et al.*, 2004).

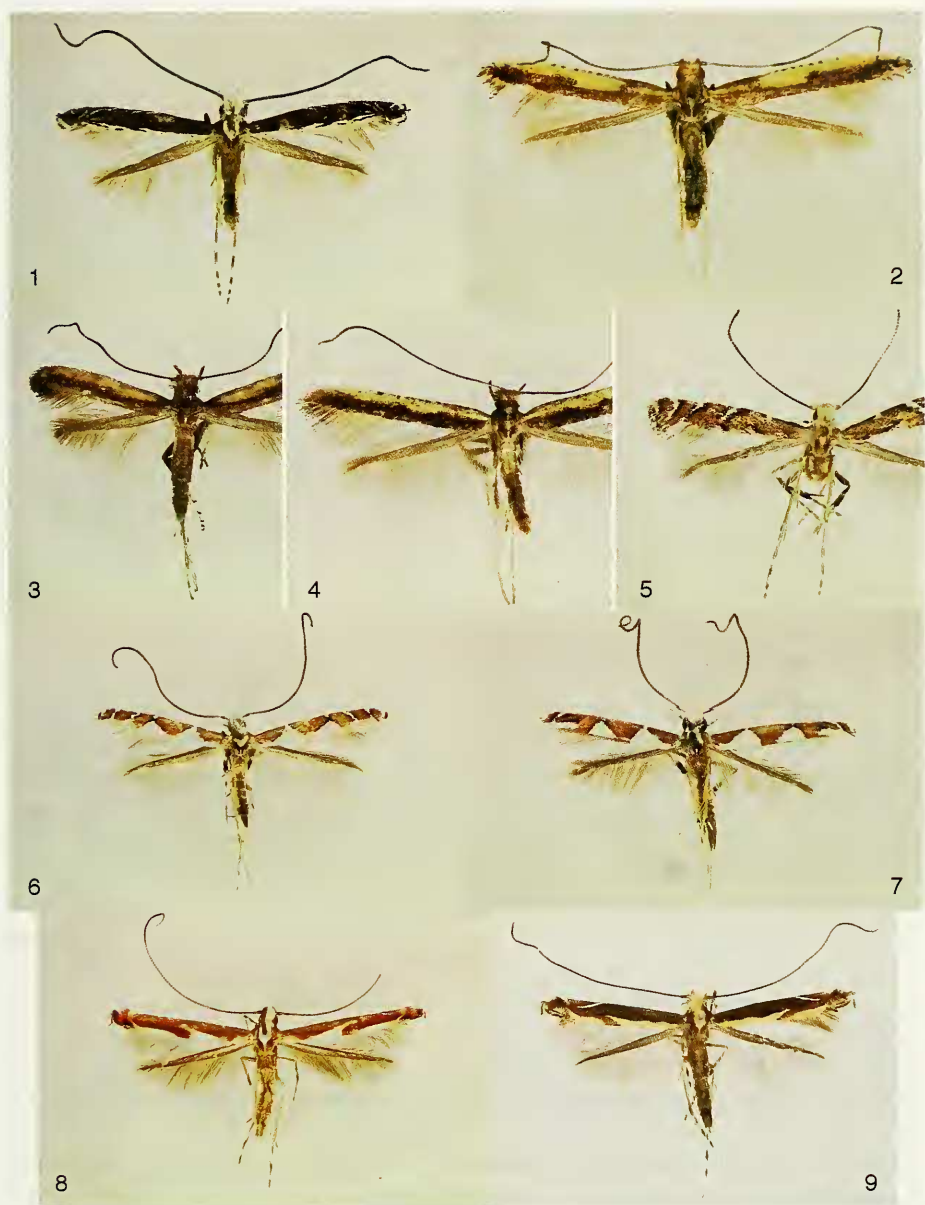
### *Acrocercops serrigera galapagosensis* ssp. n.

Figs 1, 10, 19

**MATERIAL EXAMINED:** Holotype ♂. [1] "ECU[ADOR], GALAPAGOS/ Santa Cruz, Finca Vilema/ 2km W Bella Vista, 1.iv./ 1992, M[ercury] V[apor] L[amp], leg[ir]. B. Landry". [2] "HOLOTYPE/ *Acrocercops/ serrigera galapagosensis*/ B. Landry". Specimen not dissected, in perfect condition except for a few rubbed scales on the forewings. Deposited in the MHNG.

Paratypes: 28 ♂, 28 ♀ from the Galapagos islands, Ecuador. – *Fernandina*: 1 ♀ (dissected, slide BL 1561), Cabo Douglas, S 00° 18.251', W 091° 39.047', 11.i.2002, Barrenador de yema floral *Waltheria ovata* (C. Causton, L. Roque); 1 ♀, SW side, GPS: 815 m elev[ation]., S 00° 21.270', W 91° 35.341', 14.ii.2005, u[ltra]. v[iolet]. l[ight]. (B. Landry, P. Schmitz). – *Floreana*: 1 ♂, close to Loberia, GPS: elev. 6 m, S 01° 17.002', W 90° 29.460', 11.iv.2004, uvl (P. Schmitz). – *Genovesa*: 1 ♀ (dissected, BL 1564), Bahía Darwin, 10.iii.1992, M[ercury] V[apor] L[amp] (B. Landry); 2 ♀, Bahia Darwin, 25.iii.1992, MVL (B. Landry). – *Isabela*: 1 ♂, V[olcan]. Darwin, 200 m, 11.ii.1999, U.V.L., No. 99.16 (L. Roque); 1 ♀, 11 km N Puerto Villamil, 9.iii.1989, MVL (B. Landry); 1 ♂, 1 ♀, 8.5 km N P[uer]to Villamil, 11.iii.1989, MVL (B. Landry); 2 ♂, NE slope [of] Alcedo, near pega-pega camp, GPS: elev. 483 m, S 00° 24.029' W 91° 02.895', 31.iii.2004, uvl (B. Landry, P. Schmitz); 1 ♂, Alcedo, lado NE, 200 m, camp arida alta, 14.iv.2002, UVL (B. Landry, L. Roque); 2 ♀, Tagus Cove, 13.v.1992, MVL (B. Landry); 1 ♀ (dissected, slide BL 1558), Tagus Cove, 100 m elev[ation]., 21.v.1992, MVL (B. Landry); 1 ♂ (dissected, BL 1566), ± 15 km N Pto Villamil, 25.v.1992, MVL (B. Landry). – *Marchena*: 2 ♀, 23.iii.1992, MVL (B. Landry); 1 ♂, 3 ♀ (1 dissected, slide BL 1560), Playa Negra, N 00° 18.089' W 090° 30.452', 7.iv.2002, UVL (L. Roque). – *Pinta*: 1 ♀, Plaja Ibbeston [sic], 13.iii.1992, MVL (B. Landry); 1 ♂, Plaja Ibbeston [sic], 14.iii.1992, MVL (B. Landry); 1 ♀, arid zone, 15.iii.1992, MVL (B. Landry); 1 ♂, 1 ♀ (dissected, slide BL 1556), ± 50 m elev., MVL (B. Landry); 1 ♀, ± 15 m elev., MVL (B. Landry). – *Pinzón*: 1 ♂ (dissected, BL 1565), plaja Escondida, 20.iv.2002, UVL (B. Landry, L. Roque). – *Rábida*: 1 without abdomen, Tourist trail, 3.iv.1992, MVL (B. Landry). – *San Cristobal*: 1 ♂, 4 km SE Pto Baquarizo [sic], 12.ii.1989, MVL (B. Landry); 1 ♂ (dissected, slide BL 1555), 1 km S El Progreso, 14.ii.1989, MVL (B.





FIGS 1-9

Adults of Galapagos Gracillariidae. 1. *Acrocercops serrigera galapagosensis*, holotype; 2. *Caloptilia dondavisi*, paratype male from Isabela; 3. *C. galacotra*, paratype female from type locality; 4. *C. cruzorum*, holotype 5. *Cryptolectica lazaroi*, specimen from Santa Cruz; 6. *Dialectica galapagosensis*, holotype; 7. *D. sanctaecrucis darwini*, holotype; 8. *Neurostrota magnifica*, paratype female from Santa Cruz; 9. *Neurostrota brunnea*, paratype female from Santa Cruz.

Landry); 1 ♂, 2 ♀, 4 km SE Pto Baquarizo [sic], 20.ii.1989, MVL (B. Landry); 1 ♂, base of Cerro Pelado, 22.ii.1989, MVL (B. Landry). – *Santa Cruz*: 4 ♂ (one dissected, slide BL 1557), 4 km N Puerto Ayora, 20.i.1989, MVL (B. Landry); 2 ♂, 2 ♀, Tortuga Res[erve]. W S[an]ta Rosa, 6.ii.1989, MVL (B. Landry); 1 ♂, E[stacion]. C[ientifica]. C[harles]. D[arwin]., 6.iii.1992, UVL (B. Landry); 1 ♂, 1 ♀, E.C.C.D., 7.iii.1992, UVL (B. Landry); 1 ♀, El Barranco, E.C.C.D., 13.iii.2000, MVL Trap (L. Roque); 1 ♂, 1 ♀, Finca S[teve]. Devine, 17.iii.1989, MVL (B. Landry); 1 ♂, CDRS, v.[year unknown], foodplant = *Waltheria rhinulata* [= *W. ovata*] (R. Perry & T.J. DeVries); 1 ♀, C[harles]. D[arwin]. R[esearch]. S[tation]., Barranco, 11.xi.1999, MVL (L. Roque). – *Santiago*: 1 ♀, Bahía Espumilla, 4.iv.1992, MVL (B. Landry); 1 ♂ (dissected, slide BL 1170), 200 m elev., 5.iv.1992, MVL (B. Landry); 2 ♂, Aguacate, 520 m elev., 6 & 12.iv.1992, MVL (B. Landry). Deposited in the BMNH, CNC, CDRS, MHNG, and USNM.

Other specimens. One male syntype (Fig. 28) of *Acrocerops serrigera* Meyrick (out of 34 syntypes of both sexes from Ecuador, Alausi, 9450 ft. and Huigra, 4500 ft., and Peru, Lima, 500 ft.) with the labels shown on Fig. 28 is **here designated lectotype (BMNH)**. The first (circular) label has a blue border; the last (green) label refers to my dissection. The specimen is complete and in good condition except that the wings are slightly distorted and descaled, especially the right forewing. BMNH slide number 31204 was given to this specimen upon its return to London.

Holotype of *Coriscium albomarginatum* Walsingham. The male specimen is in good condition (Fig. 29) although the antennae are partly broken. The first (circular) label (Fig. 29) has a red border; the last (green) label refers to my dissection. BMNH slide number 31203 was given to this specimen upon its return to London.

**DIAGNOSIS:** In the Galapagos this species is unique in wing pattern by virtue of having a white band along the dorsal margin of the forewing with beige as a thin line on the margin itself, and the rest of the forewing mostly blackish brown.

**DESCRIPTION: MALE** (n=26) (Figs 1, 10). Head white with some pale brown (sometimes also dark brown laterally and medially) scales projecting anteriorly between antennae; also with dark brown scales on eye margin posteriorly and on tuft projecting medially from each side of fronto-clypeus. Antenna about 1/4 longer than forewing (n=2); scape (without pecten) and pedicel dark greyish brown dorsally, white ventrally; flagellomeres greyish brown. Haustellum well-developed. Maxillary palpus porrect but ultimate palpomere somewhat drooping, dark brown laterally, white medially (sometimes last segment all white). Labial palpus drooping but upturned, pointing anteriorly; first palpomere white; second palpomere with large ventral scale tuft, laterally mostly brown with white at base and apex, medially white; third palpomere white except for brown apex. Thorax white anteriorly except for brown tegulae, with shining greyish brown scales on metathorax. Foreleg coxa dark greyish brown with white at base and apex; femur blackish brown with thin white stripes on each side of ventral edge; tibia blackish brown with small white spots at 1/3, 2/3, and apex, also with beige scaling ventrally at apex of epiphysis; tarsomere I blackish brown with large white spots subbasally and apically; tarsomeres II-IV blackish brown with white apex; last tarsomere greyish brown. Midleg femur blackish brown with thin white stripe on ventral edge; tibia blackish brown with thin, white diagonal stripe from base to middle, smaller, diagonal white stripes postmedially and subapically, and few white scales apically; tarsomere I blackish brown with white stripe from base laterally to middle dorsally and second similar stripe from middle ventrally to apex dorsally; tarsomere II-IV blackish brown on basal half and white on distal half with few blackish brown scales apically; last tarsomere blackish brown. Hindleg femur white with

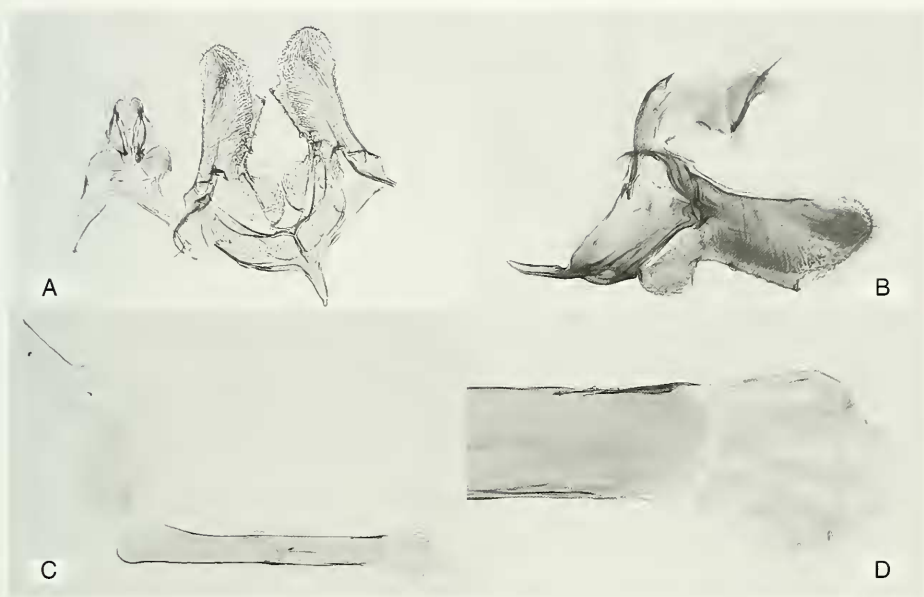


FIG. 10

Male genitalia of *Acrocercops serrigera galapagosensis*. A. Dorsoventral view without phallus and with dorsal parts detached and shown on the left; B. Lateral view without phallus; C. Phallus; D. Tip of phallus.

diagonal brown stripes submedially and postmedially, and few brown scales apically; tibia mostly dirty white with greyish brown scales laterally near apex and brown longitudinal stripe laterally on lateral spines, also with row of spinelike scales on dorsal edge; tarsomere I white at base and apex, mostly greyish brown between; tarsomeres II-IV blackish brown on basal half and white on distal half; last tarsomere mostly blackish brown with faint indication of whitish scales at apex. Forewing length: 3.42-4.19 mm. Forewing colour mostly blackish brown with white band along dorsal margin, with beige as thin line on the margin itself, with thin, short diagonal, white lines pointing apically on costa at about 1/3, 2/5, and 1/2, with thin white line from costa at 2/3 connecting near middle at 4/5 with similar line from dorsal margin, with last thin white line from 4/5 costa to tornus, and with black spot at apex surrounded with chestnut brown scales and with few white scales above connecting with white in fringe; fringe scales bicoloured around apex with bases white and apices black except for completely black tuft at very tip, fringe on dorsal margin greyish brown. Hindwing greyish brown with concolorous fringe. Abdomen dorsally greyish brown; ventrally white with brown diagonal bars laterally on most segments. Segment VIII unmodified except for being very narrow.

Male genitalia (n=5) (Fig. 10). Tegumen with narrow arms well sclerotised, slightly enlarged subdorsally, narrowing before dorsal connection forming short, posteriorly projecting triangle; arms with postmedian, posteriorly directed, short, and laterally flattened projections shaped like distal end of tuba (but slightly down-curved)



and separated from subscaphium by distinct suture. Vinculum rather wide, with rather narrow pointed saccus about as long as width of vinculum and directed anteriorly. Subscaphium in two laterally flattened, separated lateral parts (without sclerotised connection) more or less shaped like moderately narrow "C" opening posteroventrally with distal ends free and rounded, reaching  $3/4$  length of valva. Transtilla membranous, undifferentiated. Valva with dorsal margin strongly sclerotised, with curved and narrow "apophysis" extending anteriorly beyond anterior margin of vinculum; posterior section lightly sclerotised, projecting upward slightly, broadly rounded, with scales and short setae along margin; base wide for short distance, as if forming ventral extension, posteriorly rounded, moderately sclerotised, not reaching ventral mid-line, covered with microtrichiae and few setae medially, with scale sockets laterally, followed by strongly sclerotised section of ventral margin and adorned with 3-6 teeth of short to medium size (the largest at base and apex), directed medially; median surface of valva posteriorly with densely set short and long thick (rather wide but apically pointed) setae, also with long thick setae on ventral half, along toothed part of ventral margin, but slightly above from it, and with small rounded knob adorned with long and narrow setae at base of toothed ventral margin. Phallus a narrow, straight cylinder slightly wider at base, about as long as valva + tegumen (without the saccus), subapically with 0-3 very short teeth, one behind the other, slightly on left of dorsal midline; vesica with short to rather long micro-spinules, but no cornuti.

FEMALE (n=27). Antennal flagellomeres slightly thinner than those of the male; colour as in male. Forewing length: 3.70-4.46 mm. Frenulum with two acanthae. Female genitalia (n=5) (Fig. 19). Papillae anales rather narrow, connected apically, weakly sclerotised, with short setation along posterior surface, minute setae on most of surface, a few (7-10) long setae along ventrally and dorsally unconnected narrow sclerotised band of anterior margin. Each anterior narrow sclerotised band of papillae anales connected subapically with medium-sized quadrangular sclerotised platelike base of short (just reaching basal plates of anterior apophyses) and straight posterior apophyses. Anterior apophyses from small triangular basal plate with narrow sclerotised band connected dorsally, more than 2X length of posterior apophyses, reaching into segment VII for short distance, with slight bend medially, slightly directed mediodorsally, slightly narrower after bend. Sternum VII large and strongly sclerotised, medially with narrow band devoid of scale sockets or spinules from antrum to apical margin; apical margin forming two low, broadly rounded lobes; with areas lateral of antrum covered with sharp spinules. Antrum situated at base of sternum VII medially; ostium surrounded by circular, thickly sclerotised rim enlarging dorsally into rounded plate extending as point into ductus bursae and forming part of its dorsal wall; ventrally and laterally with sclerotised band devoid of scale sockets or setae, shaped like widely-opened C opening posteriorly, slightly protruding from wall of sternum VII posteriorly. Ductus bursae of medium width, basal  $1/3$  with smoothly sclerotised wall, median  $1/3$  with sclerotised ridges, distal  $1/3$  membranous. Inception of ductus seminalis on ductus bursae shortly before middle. Corpus bursae slightly longer than ductus bursae, shaped like narrow pear, without ornaments.

ETYMOLOGY: The subspecies' name refers to the type locality.

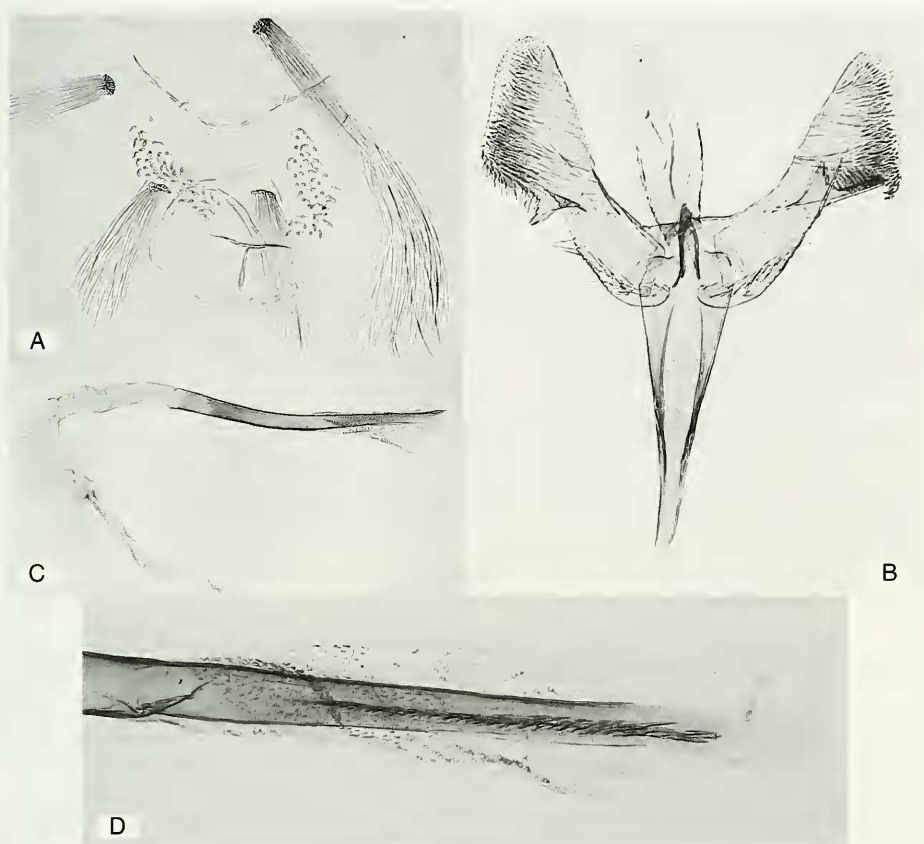


FIG. 11

Male of *Caloptilia dondavisi*. A. Abdominal segments VII-VIII; B. Genitalia without phallus; C. Phallus; D. Tip of phallus.

**BIOLOGY:** Caterpillars were reared from flower buds of *Waltheria ovata* Cav. (Sterculiaceae), a common Galapagos lowland native shrub also occurring in Peru (McMullen, 1999). The rearing records are from Fernandina and Santa Cruz, but *W. ovata* also occurs on most of the larger islands of the archipelago (McMullen, 1999). The moths come to light and specimens were collected between sea level and 900 m in elevation, between January and May, and in November.

**DISTRIBUTION:** Galapagos islands of Fernandina, Floreana, Genovesa, Isabela, Marchena, Pinta, Pinzón, Rábida, San Cristobal, Santa Cruz, and Santiago.

**REMARKS:** Two incorrect locality names cited in the list of specimens examined should read "plaja Ibbetson" and "Puerto Baquerizo". The 26 male specimens examined from the Galapagos of this species are smaller (males = 3.42-4.19 mm forewing length) than the lectotype of *Acrocercops serrigera* Meyrick (Fig. 28), which has a forewing length of 4.38 mm, and there is no apparent black spot at the apex of the forewing in this specimen. These are the main reasons for recognizing the

Galapagos populations as a separate subspecies of *A. serrigera*. *Acrocercops albomarginata* (Walsingham) is similar to *A. serrigera*, but the following differences are here considered to be valid at the species level. Firstly, with a 3.00 mm forewing length, the holotype of *A. albomarginata* (Fig. 29) is smaller than all Galapagos males of this species, which are smaller than the continental type of *A. serrigera*. Secondly, its white forewing diagonal markings are wider and the most apical ones (from about 2/3) are shorter and not contiguous along midline. Also, there is no contrasting black spot apically (although this may be due to general discoloration). In the male genitalia of the holotype of *A. albomarginata*, the vinculum is slightly broader, differently sclerotised, its saccus is shorter by about 50% and broader, and the length of the whole genitalia and that of the phallus are shorter (by about 14%) (although this may be due to the fact that the specimen is smaller).

### *Caloptilia* Hübner, [1825]

*Poeciloptilia* Hübner, [1825]

*Ornix* Kollar, 1832

*Ornix* Treitschke, 1833

*Coriscium* Zeller, 1839

*Calliptila* Agassiz, 1847

*Antiolopha* Meyrick, 1894

*Caloptilia* is a large and widespread genus. 294 species have been described (De Prins & De Prins, 2005) including 17 from the Neotropical Region (Davis & Miller, 1984). Food plants involve numerous families of dicotyledons such as Anacardiaceae, Ericaceae, Euphorbiaceae, Leguminosae, Ulmaceae, etc. (see Robinson *et al.*, 2004).

### *Caloptilia dondavisi* sp. n.

Figs 2, 11, 20, 32

MATERIAL EXAMINED: Holotype ♂. [1] "ECU[ADOR], GALAPAGOS/ Isabela, V[olcan]. Darwin/ 300 m elev[ation]., 15.v.1992/ M[ercury]. V[apor]. L[amp]. *leg[it]*. B Landry". [2] "HOLOTYPE/ *Caloptilia* / *dondavisi*/ B. Landry". Specimen complete but slightly rubbed on forewing bases. Deposited in the MHNG.

Paratypes: 41 ♂, 49 ♀ from the Galapagos, Ecuador. – *Española*: 3 ♂ (one dissected, slide BL 1173), 3 ♀ (1 dissected, slides BL 1573), Bahia Manzanillo, 29.iv.1992, M[ercury] V[apor] L[amp] (B. Landry). – *Fernandina*: 1 ♀ (dissected, slide BL 1567), zona de vegetacion, 19.vi.1998, # 98: 74, B[lack] L[ight], F[luorescent] L[ight] (L. Roque, C. Causton); 1 ♀, SW side, GPS: 352 m elev[ation]., S 00° 20.503', W 091° 36.969', u[ltra] v[iolet] l[ight], 10.ii.2005 (B. Landry, P. Schmitz); 2 ♂, 1 ♀ (dissected, slide MHNG 3012), SW side, GPS: 815 m elev., S 00° 21.270', W 091° 35.341', uvl, 11.ii.2005 (B. Landry, P. Schmitz); 1 ♂, SW side, crater rim, GPS: 1341 m elev., S 00° 21.910', W 091° 34.034', uvl, 13.ii.2005 (B. Landry, P. Schmitz); 1 ♂, 1 ♀, SW side, GPS: 815 m elev., S 00° 21.270', W 091° 35.341', uvl, 14.ii.2005 (B. Landry, P. Schmitz). – *Genovesa*: 1 ♀, Bahia Darwin, MVL, 10.iii.1992 (B. Landry). – *Isabela*: 1 ♂, V[olcan] Darwin, campamento base, BL-W[hite] L[ight] Trap, LR # 2000-04, 1.iii.2000 (L. Roque); 1 ♂, 2 km W Puerto Villamil, MVL, 5.iii.1989 (B. Landry); 2 ♀, Alcedo, lado NE, camp arida alta, 200 m, UVL, 14.iv.2002 (B. Landry, L. Roque); 2 ♂ (one dissected, slide BL 1569), 1 ♀, Alcedo, lado NE, camp pega-pega, 400 m, UVL, 15.iv.2002 (B. Landry, L. Roque); 1 ♀, Alcedo, lado NE, camp guayabillos, 700 m, UVL, 16.iv.2002 (B. Landry); 2 ♂, 3 ♀, Alcedo, lado NE, low arid zone, bosq[ue] palo santo, UVL, 18.iv.2002 (B. Landry, L. Roque); 1 ♂, 3 ♀ (one dissected, slide BL 1568), Tagus Cove, MVL, 13.v.1992 (B. Landry); 1 ♀, same data as holotype; 1 ♂, ± 15 km N P[uer]to Villamil, MVL, 25.v.1992 (B. Landry). – *Marchena*: 2 ♂, MVL, 12.iii.1992 (B. Landry); 1 ♂ (dissected, slide BL 1575), 1 ♀, MVL, 23.iii.1992 (B. Landry); 2



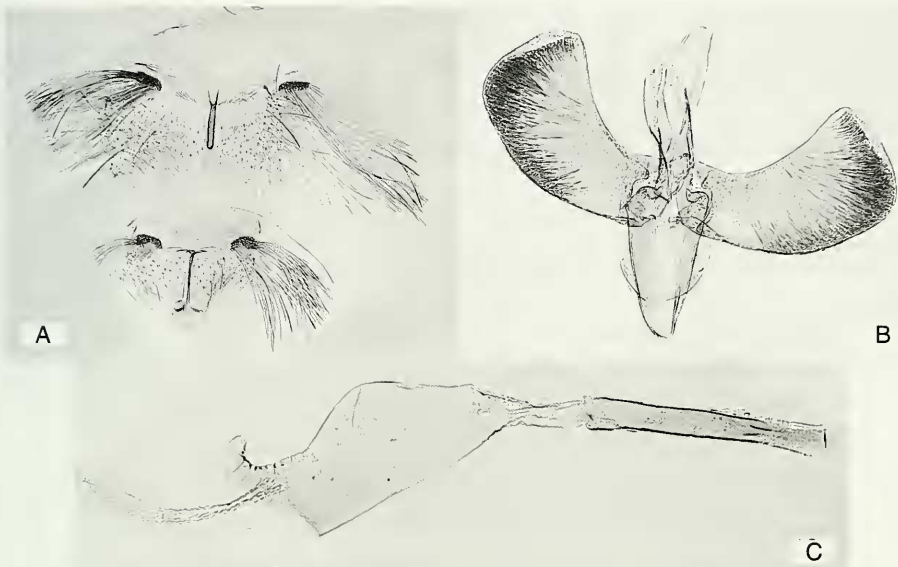


FIG. 12

Male of *Caloptilia galacotra*. A. Abdominal segments VII-VIII; B. Genitalia without phallus; C. Phallus.

♀, Playa Negra, N0018.089' W=9030452 [sic], UVL, 7.iv.2002 (L. Roque). – *Pinta*: 1 ♀, Plaja [sic] Ibbeston [sic], MVL, 13.iii.1992 (B. Landry); 1 ♂, 1 ♀, Plaja [sic] Ibbeston [sic], MVL, 14.iii.1992 (B. Landry); 2 ♀, arid zone, MVL, 15.iii.1992 (B. Landry); 1 ♂, 200 m elev., MVL, 16.iii.1992 (B. Landry); 1 ♂ (dissected, slide BL 1572), 400 m elev., MVL, 17.iii.1992 (B. Landry); 1 ♂, 1 ♀ (dissected, slide BL 1577), 400 m elev., MVL, 18.iii.1992 (B. Landry); 1 ♂, ± 50 m elev., MVL, 20.iii.1992 (B. Landry); 1 ♂, ± 15 m elev., MVL, 21.iii.1992 (B. Landry). – *Rabida*: 1 ♀, tourist trail, MVL, 3.iv.1992 (B. Landry). – *San Cristobal*: 2 ♂, 1 ♀, transition zone, SW El Progreso, GPS: elev. 75 m, S 00° 56.359' W 89° 32.906', uvl, 15.iii.2004 (B. Landry, P. Schmitz); 2 ♂, 1 ♀, near Loberia, GPS: elev. 14 m, S 00° 55.149' W 89° 36.897', u[ltra] v[iolet] l[ight], 16.iii.2004 (B. Landry, P. Schmitz). – *Santa Cruz*: 1 ♀, Barranco, 10 m s[obre el] n[ivel del] m[ar], S 00°44'34" W 090°18'21", MVL Trap, L[azaro] R[oque] # 2000-01, 26.i.2000 (L. Roque); 3 ♀, finca M. E. Guerra & S. Henderson, GPS: 186 m elev., S 00° 41.997', W 090° 19.195', reared from *Rhynchosia minima* coll[ected]. 6.ii.2005. emerged 14.ii.2005 (B. Landry); 1 ♀, casa L. Roque-Albelo & V. Cruz, GPS: 137 m elev., S 00° 42.595', W 090° 19.196', uvl, 27.ii.2005 (B. Landry); 4 ♂ (one dissected, slide BL 1574), 4 ♀, E[stacion] C[ientifica] C[harles] D[arwin], UVL, 6.iii.1992 (B. Landry); 1 ♂, 1 ♀, transition zone, recently cut road, GPS: S 00° 42.528' W 90° 18.849', uvl, 12.ii.2004 (B. Landry, P. Schmitz); 1 ♂, 1 ♀, Finca S[teve] Devine, MVL, 17.iii.1989 (B. Landry); 1 ♂, Finca Vilema, 2 km W Bella Vista, MVL, 1.iv.1992 (B. Landry); 2 ♂, 4 ♀, casa L. Roque-Albelo & V. Cruz, ex *Rhynchosia minima* leaf mines coll. 2.ix.2004, 04 CDRS 37 (L. Roque-Albelo); 1 ♂, 1 ♀, C[harles] D[arwin] R[esearch] S[tation], Barranco, MVL, 11.xi.1999 (L. Roque). – *Santa Fe*: 1 ♂, 2 ♀ (one dissected, slide BL 1570), tourist trail, MVL, 28.v.1992 (B. Landry). *Santiago*: 1 ♂ (dissected, slide BL 1571), Bahía Espumilla, MVL, 4.iv.1992 (B. Landry); 1 ♂, 200 m elev., MVL, 5.iv.1992 (B. Landry); 1 ♀, Aguacate, 520 m elev., MVL, 7.iv.1992 (B. Landry). Deposited in the BMNH, CNC, CDRS, MHNG, and USNM.

Other specimens examined. Four specimens without abdomens with same data as some of the paratypes.

**DIAGNOSIS:** Several features of the forewing of this species (Fig. 2) are good diagnostic characters when compared with other Gracillariidae or other micro moths of the Galapagos. For example, the ochre or yellow costal band enlarged towards the dorsal margin before middle and the blackish brown band with a conspicuous purple lustre along the dorsal margin. More diagnostic characters are mentioned above in the key.

**DESCRIPTION: MALE** (n=31) (Figs 2, 11). Head dorsally greyish brown with purplish lustre, with posterolateral tufts appressed medially over occiput and posterior part of vertex, with longer scales directed anteriorly, appressed over anterior part of vertex, and reaching antennal bases; fronto-clypeus white with ochre laterally; with few white scales along eye margin dorsally and with dark greyish brown above and anterior to antennal bases. Antenna as long as forewing (n=3); scape greyish ochre dorsally, blackish brown anteriorly, with pecten of up to nine, short, very thin, greyish brown scales on basal half; pedicel and first flagellomere greyish brown dorsally, blackish brown ventrally; rest of flagellum greyish brown. Haustellum well developed. Maxillary palpus porrect, white dorsally and around last segment, dark brown ventrally. Labial palpus drooping, directed anteriorly at about half right angle, dorsally white, ventrally with ochre brown and dark brown. Thorax with purple lustre, mostly greyish brown, darker brown at bases of tegulae, yellowish ochre at apices of tegulae, grey and shining on apical segments. Foreleg coxa dark brown; femur blackish brown with white laterally near middle and subapically; tibia blackish brown with few dirty white scales laterally near middle; tarsomeres white with small blackish brown patch at apex of tarsomeres I-III. Midleg femur blackish brown with few white or ochre scales near middle and apically; tibia blackish brown with white at apices of spines; tarsomeres as on foreleg. Hindleg coxa basally dark brown, apically white; femur white on basal half with few dark brown scales on ventral edge basally, with large dark brown patch post-medially, dirty white apically; tibia without dorsal spines, beige with faint greyish tinge on distal half; tarsomeres beige, without dark patches. Forewing length: 3.16-3.89 mm (holotype: 3.74 mm). Forewing colour ochre yellow on costal half except for purplish brown basal 1/4, with ten or more small blackish brown spots along costa from base (where they are less distinct) to 2/3; dorsal half ochre brown with purplish lustre on basal 1/2, brown to blackish brown with more or less distinct purple lustre on most of apical 1/2; also with blackish brown spot in middle along midline; fringe greyish brown toward base, blackish brown on apical 1/5 of wing, with longest scales forklike with very thin stem and 3-5 pointed apical section. Hindwing greyish brown; fringe greyish brown with bronze lustre. Abdomen dorsally shining grey, ventrally dirty white. Intersegmental membrane VI-VII about as long as segment VI. Tergum VII not sclerotised. Sternum VII with very narrow sclerotised band extending laterally, followed laterally with pair of tufts of hairlike, apically pointed scent scales about as long as segments I-III, and medially with narrow transverse band of fine setulae. Intersegmental membrane VII-VIII about 1/5 length of preceding intersegmental membrane, laterally with band of short, flat, beaver tail-shaped setae on elongate, onionlike peduncles. Tergum VIII with narrow, median, sclerotised structure shaped like double hook with basal, perpendicular branch extended on each side of median, longitudinal branch, laterally with pair of tufts of scent scales as on segment VII but about 1/3 of

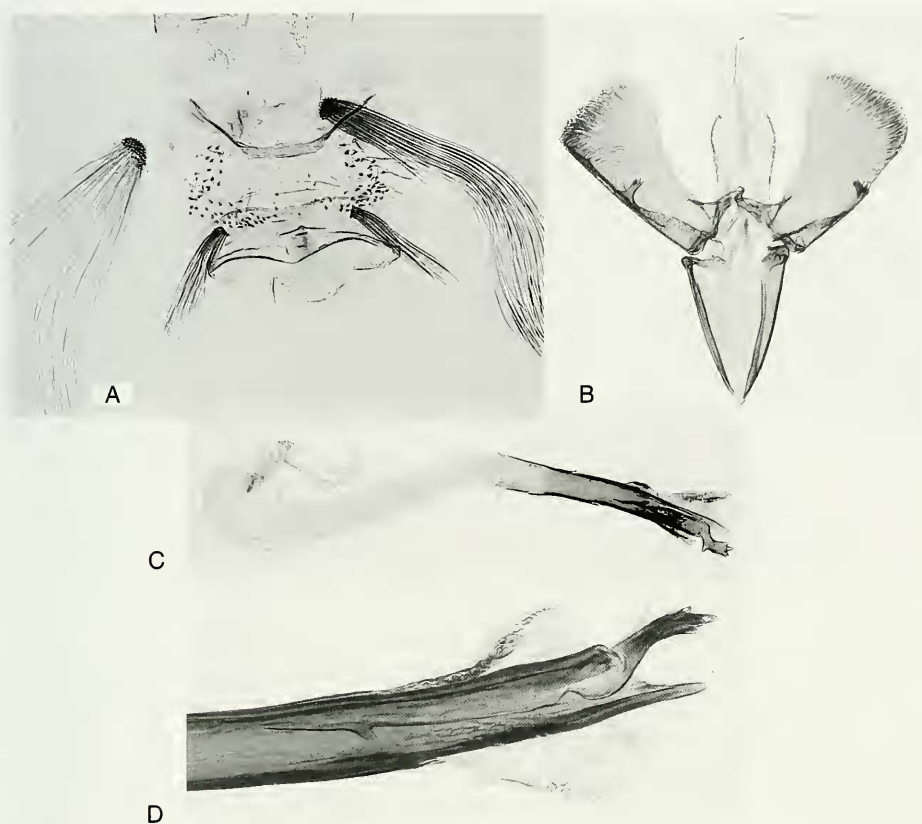


FIG. 13

Male of *Caloptilia cruzorum*. A. Abdominal segments VII-VIII; B. Genitalia without phallus; C. Phallus; D. Tip of phallus, dorsal view.

length. Sternum VIII with narrow, poorly sclerotised band extending laterally around bases of scale tufts.

Male genitalia (n=6) (Fig. 11). Tegumen with very narrow arms less strongly sclerotised at posterior connection, slightly shorter than valva and about as wide as base of valva. Vinculum arms short, not differentiated from trough-shaped saccus; saccus about as long as valva, gently tapering, narrowly rounded at anterior end. Subscaphium with narrow sclerotised band medially from dorsal junction of valvae to apex of anal tube, without setae. Transtilla membranous, with short setae and scobination. Valva of medium width at base, slightly narrower near middle, posteriorly enlarged with apical margin almost straight; ventral margin with short triangular projection slightly beyond middle; median surface along apical margin covered with several rows of stiff setae, shortest ones nearest margin, longest ones furthest from margin and reaching middle of valva, with thin setae of moderate length along ventral margin from base to ventral projection and at base of ventral projection medially.



Phallus a narrow cylinder slightly larger at base, slightly shorter than length of valva + saccus, frequently protruding between valvae on dead specimens, without coecum penis, with narrow bulbus ejaculatorius, apically with right wall lightly sclerotised compared to left wall; vesica with short, slightly curved cornuti in row of about 1/3 length of whole phallus.

FEMALE (n=35). Antenna (n=3) and colour as in male. Forewing length: 2.53-3.89 mm. Frenulum with two acanthae. Sterna VI and VII slightly more strongly sclerotised than other sterne, with cuticle wrinkled; apical margin of sternum VII forming pair of low, rounded projections on each side of low median emargination. Tergum VII more strongly sclerotised than other abdominal segments, especially along midline and along shallowly concave apical margin. Female genitalia (n=6) (Fig. 20). Papillae anales laterally compressed, triangular, with few long setae mostly along anterior sclerotised band, also with short setae and micro-setae. Posterior apophyses basally about 1/2 as wide as width of papillae anales, straight, gently tapering to narrowly rounded apex, reaching into segment VIII. Tergum VIII moderately wide along dorsal midline, slightly wider laterally, separated from sternum VIII by narrow gap. Anterior apophyses with separate narrow branches from anterolateral corners of sternum and tergum VIII, forming narrow V, slightly shorter than posterior apophyses. Sternum VIII narrowly convex, with microsculpture in the shape of posteriorly pointing spines laterally, becoming wider crescents towards middle; anterior margin with sclerotised projection medially, forming dorsal wall of antrum. Ostium bursae close to anterior margin of sternum VIII medially, circular. Ductus bursae long and narrow, only slightly widening from middle, wall of basal 1/3 smoothly sclerotised. Inception of ductus seminalis at basal 1/3 of ductus bursae. Corpus bursae circular, small, diameter about 1/4 length of ductus bursae, reaching into segment III; pair of laterally situated, long, claw-shaped signa shortly crossing in middle of corpus bursae, with bases protruding from corpus wall, with posterior margins serrated.

ETYMOLOGY: The species is named after Dr. Don R. Davis, Gracillariidae specialist at the Smithsonian Institution, Washington, for his help in the generic assignment and determination of new species status of this species and the other Gracillariidae of the Galapagos.

BIOLOGY: Lazaro Roque-Albelo and I were able to rear several specimens of this species from mined leaves of *Rhynchosia minima* (L.) DC., (Leguminosae) (Fig. 32). The host plant is a perennial vine native to the Galapagos that is also known from other tropical regions around the world. It typically colonizes disturbed sites (McMullen 1999). The moths are attracted to light and were collected from March to June, and in September and November, mostly at low elevations, but also up to 1341 meters above sea level.

DISTRIBUTION: Galapagos islands of Española, Fernandina, Genovesa, Isabela, Marchena, Pinta, Rábida, Santa Cruz, Santa Fé, and Santiago.

REMARKS: In the list of paratypes, the Pinta locality called "plaja Ibbeston" should spell "playa Ibbetson." One dissected female had two spermatophores in its corpus bursae, one twice the size of the other. In forewing pattern this species is some-



S[tation], UVL, 20.iii.2002 (L. Roque); 1 ♂, CDRS, wall of Invert[ebate]s. Lab[oratory]., GPS: elev. 11 m, S 00° 44.478', W 90° 18.132', uvl, 6.iv.2004 (B. Landry, P. Schmitz); 2 ♂, E.C.C.D., Barranco, en M.V.L., 13.ix.1999 (L. Roque); 1 ♂, C.D.R.S., Barranco, M.V.L., 11.vi.1999 (L. Roque). – *Santiago*: 3 ♂ (one dissected, slide BL 1578), 4 ♀ (one dissected, slide BL 1583), Cerro Inn, MVL, 28.iii.1992 (B. Landry); 1 ♂, Bahía Espumilla, MVL, 4.iv.1992 (B. Landry); 1 ♂, 1 ♀, same data as holotype. Deposited in the BMNH, CDRS, CNC, MHNG, and USNM.

Other specimens examined. Four specimens without abdomens from the same collecting localities as some of the paratypes.

**DIAGNOSIS:** The forewing's brownish colour with a purple lustre, with or without paler beige markings and without a larger antemedian pale patch as in the other two *Caloptilia* species in the Galapagos, is usually sufficient to separate this species from the other Gracillariidae or other micro moths of the Galapagos. However, in some specimens of *Caloptilia cruzorum*, described below, the larger antemedian pale patch of the forewing is reduced, in which case the smaller wingspan of *C. galacotra* and genitalic characters mentioned in the key above will be useful.

**DESCRIPTION:** MALE (n=23) (Figs 3, 12). Head brown with scales slightly paler, beige, at bases and apices, and with pink or white lustre, with posterolateral tufts usually appressed medially over occiput and posterior part of vertex and just touching each other (sometimes somewhat projected upwards), with longer scales directed anteriorly, appressed over anterior part of vertex, and reaching beyond antennal bases (sometimes also projected in various directions); fronto-clypeus with paler, greyish-beige scales except for lateral dark brown and blackish brown tufts; posterior margin of eye mostly with dark brown scales and few white ones. Antenna slightly longer than forewing (ratio: 1.17-1.20, n=3); scape blackish brown except for small white spot apically; pedicel blackish brown; flagellomeres greyish brown with scales slightly darker on their distal half. Haustellum well developed. Maxillary palpus porrect; mostly dark brown to blackish brown, with whitish beige dorsally on second (penultimate) palpomere. Labial palpus drooping and directed anteriorly or upturned and pointing dorsally; whitish beige on first palpomere, dorsally on second for most of length, at base of third and sometimes as thin longitudinal line dorsally on third, elsewhere dark greyish brown, with scales paler at their bases and apices, except for beige tip of third palpomere. Mesothorax and tegulae mostly brownish grey with scales paler, greyish beige, at their apices and sides, with slight purple lustre; bases of tegulae blackish brown; scales of metathorax greyish white, shining. Legs mostly brown with scales paler at their bases and apices. Foreleg coxa with white or beige tuft at base, followed by brown to blackish brown toward apex; femur blackish brown with small white or beige spot near middle; tibia blackish brown with small white or beige patches sub-basally and before middle; tarsomere I basally with blackish brown spot followed by white spot, dark greyish brown for most of length, with subapical white spot, and apical blackish brown spot; tarsomere II white at base, followed with greyish white spotted with dark brown, blackish brown apically; tarsomeres III-V greyish white or greyish beige with apical blackish brown spot. Midleg femur blackish brown, with or without beige spots near middle and subapically, with scale tuft on ventral edge expanding from middle to apex over base of tibia; tibia blackish brown, usually with small beige or white spot medially, dorsally with scale tuft expanding to about 2X basal width from middle to before apex, with apices of tibial spines beige; tarsomeres as in



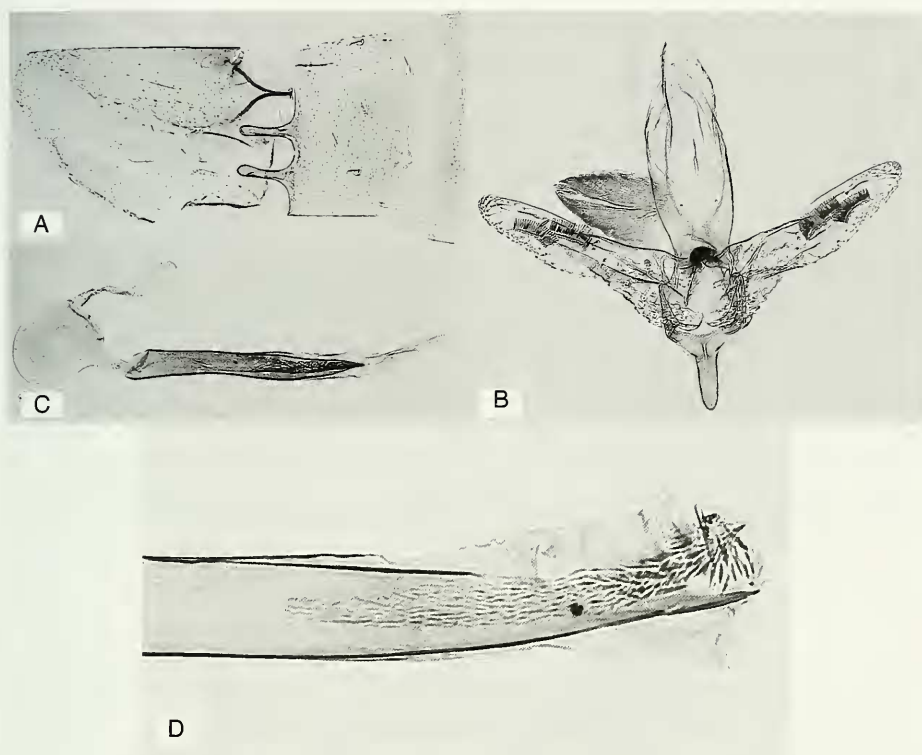


FIG. 15

Male of *Dialectica galapagosensis*. A. Abdominal segments VII-VIII; B. Genitalia without phallus; C. Phallus; D. Tip of phallus.

foreleg. Hindleg coxa basally dark brown, apically beige; femur beige on basal half with few blackish brown scales on ventral edge basally, with large blackish brown patch postmedially, pale greyish brown apically; tibia without dorsal spines, pale greyish brown with darker greyish brown ventrally before apical spines and on apical spines, with beige at apex of apical spines; tarsomeres greyish brown, slightly darker toward apices, with medial beige colour showing dorsally at apices. Forewing length: 2.73-4.48 mm (holotype: 4.04 mm). Forewing costa on basal 1/5 mostly blackish brown with some beige scales, subsequently mostly ochre-beige with or without blackish brown to brownish grey spots variable in size; dorsal half mostly greyish brown becoming darker, blackish brown toward apex; with purple lustre especially on darker areas; subapically with beige spot on costa sometimes associated with other spots toward dorsal margin, rarely forming complete bar; usually with small beige spot at apex; fringe greyish beige to tornus, blackish brown from tornus to apex. Hindwing greyish brown, fringe concolorous with bronze lustre. Abdominal segment I dorsally greyish white, other segments darker, greyish brown, not as shining as segment I; ventrally white with more or less dense sparkling of blackish brown scales. All sterna with

scales not set randomly but in more or less regular rows. Intersegmental membrane VI-VII about as long as segment VI. Segment VII about  $2/3$  length of segment VI. Tergum VII with lightly sclerotised area medially, shaped like triangle pointing posteriorly; following area membranous with rather dispersed cover of narrow, apically bi-pointed scales slightly shorter than median rod of sternum VII. Sternum VII at base with narrow sclerotised band enlarged medially, posteromedially on sclerotised band with free narrow rod projecting posteriorly inside segment and about half as long as width of segment VII; lateroposteriorly abutting sclerotised band with pair of tufts of apically pointed hairlike scent scales about as long as segment VI; without setulae medially; area following sclerotised band laterally with scales as on tergum. Intersegmental membrane VII-VIII about  $1/3$  length of preceding, devoid of scales or setae. Segment VIII about  $1/4$  shorter than preceding. Tergum VIII with narrow, median, longitudinal sclerotised support structure for whole length with short perpendicular bar apically; rest of surface membranous with scales as on preceding segment. Sternum VIII with lightly sclerotised band with posterolateral tufts of scent scales slightly longer than  $1/2$  length of those of sternum VII.

Male genitalia ( $n=4$ ) (Fig. 12). Tegumen narrow arms with posterior sclerotised and scaled areas not joined at apex, about  $1/5$  shorter than valva, about as long and as wide as saccus. Vinculum arms not differentiated from base of saccus; saccus as small row-boat, slightly longer than wide, lateral margins gently tapering to rounded distal end, ventral surface slightly upturned distally. Subscaphium with single, median, longitudinal, sclerotised band very narrow at base, slightly widened before middle, gently tapering at apex. Transtilla membranous, with short setae and scobination. Valva somewhat quadrangular with rounded angles, slightly enlarged and upturned apically,  $2X$  as long as basal width and  $1.5X$  as long as terminal width, without projection; median surface along ventral margin covered with pointed, scalelike setae from apex to slightly before middle of margin, shortest setae closest margin, longest setae furthest margin in ventroapical sector and with apices reaching dorsal margin; with short hairlike setae along ventral margin, apical margin, and on median surface toward base, also with microspinules toward base on median surface; dorsomedian angles connected by short, narrow, thickly sclerotised bridge with pair of narrow, ventrally projecting rods serving to direct the phallus. Phallus a short, narrow cylinder about as long as valva on its dorsal edge, of same girth for whole length, not protruding between valvae on dead specimens, without coecum penis, apically with walls equally sclerotised, bulbus ejaculatorius about  $3X$  longer than wide; vesica without cornuti, with fine, narrow scobination.

FEMALE ( $n=19$ ). Antenna and colour as in male. Forewing length: 3.09-4.35 mm. Frenulum with two acanthae. Surface of segments VI and VII not wrinkled; segment VII more thickly sclerotised than all others; tergum VII with apical margin broadly concave; sternum VII with apical margin straight. Female genitalia ( $n=5$ ) (Fig. 21). Papillae anales short, about  $2X$  as wide as long, without sclerotised or setose connections dorsally or ventrally, with basal sclerotised band of medium width for whole length, with rather abundant setation, short to moderately long, also with microsetae dorsally. Posterior apophyses rather narrow, narrowing near middle, reaching bases of anterior apophyses. Tergum VIII with sclerotised area moderately wide dorsally,

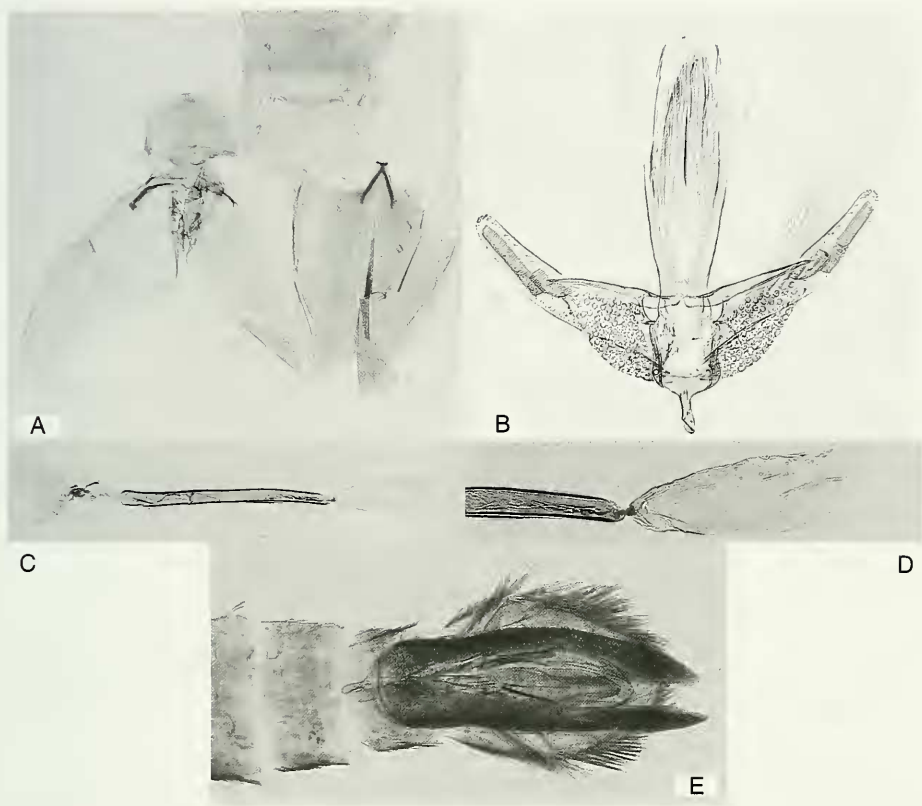


FIG. 16

Male of *Dialectica sanctaecrucis darwini*. A. Abdominal segments VII-VIII; B. Genitalia without phallus; C. Phallus; D. Tip of phallus; E. Genitalia in situ.

extending lateroventrally into narrow triangles not connected to sternum VIII. Anterior apophyses rather narrow, about as wide and as long as posterior apophyses, slightly curved, pointing straight anteriorly, connected distally with narrow arms of sternum VIII thus forming asymmetric V. Sternum VIII a narrow band forming inverted U with arms gradually tapering and opening. Ostium bursae in membrane medially, close to anterior margin of narrow sternum VIII, without sclerotised antrum. Ductus bursae very long and narrow, without modifications or sclerotised areas. Inception of ductus seminalis very close to ostium. Corpus bursae somewhat ovoid but with base larger than distal end, twice as long as terminal segments from distal end of anterior apophyses to apical margin of papillae anales, reaching into segment I; pair of laterally located, claw-shaped and posteriorly curved signa rather short, not reaching middle of corpus bursae, with posterior margins (inside curve) serrated, with bases tonguelike, protruding from wall of corpus bursae.

ETYMOLOGY: The new name refers to the Galapagos Conservation Trust (UK). Their help in financing this project is gratefully acknowledged.

**BIOLOGY:** Unknown, although moths are attracted to light and were collected from sea level to an elevation of 630 meters from January to May and in September and November.

**DISTRIBUTION:** Galapagos islands of Fernandina, Isabela, San Cristobal, Santa Cruz, and Santiago.

**REMARKS:** In the list of paratypes the San Cristobal locality spelled on the label as "P[uer]to Baquarizo" should be "P[uer]to Baquerizo." In the description of the posterior segments of the abdomen the limits of segments VII and VIII and their intersegmental membranes are not clear.

*Caloptilia cruzorum* sp. n.

Figs 4, 13, 22, 33

**MATERIAL EXAMINED:** Holotype ♂. [1] "ECU[ADOR], Galápagos, Fernandina/S[outh]W[est] side, crater rim, GPS:/ 1341 m elev[ation], S 00° 21.910' / W 091° 34.034', u[ltra]v[iolet]l[ight], 12.ii.2005/ B. Landry & P. Schmitz". [2] "HOLOTYPE/ Caloptilia / cruzorum/ B. Landry". The specimen is in perfect condition. Deposited in the MHNG.

Paratypes: 8 ♂, 6 ♀, 1 of undetermined sex from the Galapagos Island of Fernandina, Ecuador. – *Fernandina*: 1 ♂, 1 ♀ with same data as holotype; 7 ♂ (two dissected, slides MHNG 2938, 3011), 5 ♀ (one dissected, slide MHNG 2937) with same data as holotype except collecting date (13.ii.2005); 1 of undetermined sex from SW side of crater rim, reared from *Galactia* prob. *sriata* coll. 14.ii.2005, emerged before 28.ii.2005 (found dead in cage). Deposited in the BMNH, CDRS, MHNG, and USNM.

**DIAGNOSIS:** In general forewing pattern and colour this species is similar to *Caloptilia galacotra*, but it is larger and its forewing usually has a larger pale patch between about 1/5 and 2/5, as in *C. dondavis*.

**DESCRIPTION:** MALE (n=9) (Figs 4, 13). Head dorsally beige, brown, or greyish brown with scales darker at their apices and with purple lustre on darker scales, with row of very short white scales along margin of eye, with posterolateral tufts appressed medially over occiput and posterior part of vertex, with longer scales directed anteriorly, appressed over anterior part of vertex, reaching beyond antennal bases at level of middle of eye, and with farthest reaching scales whitish apically; frontoclypeus beige brown with dark brown at dorsal corners, below antennal bases. Antenna slightly longer than forewing (ratio: 1.01-1.09, n=3); scape dark brown dorsally with purple lustre, whitish beige ventrally, with pecten of up to seven narrow scales of same length as scape or shorter; pedicel and first two flagellomeres coloured as scape; rest of flagellum greyish brown. Haustellum well developed. Maxillary palpus porrect, beige with dark brown mostly at apices of penultimate and last palpomeres. Labial palpus more or less upturned, sometimes reaching upper margin of eye, white on first palpomere, beige dorsally on penultimate palpomere except apex, on basal half and sometimes apex of last palpomere, otherwise dark brown. Thorax anteriorly dark brown and greyish brown, with purple lustre, darker at bases of tegulae, with beige longitudinal stripe medially; shining greyish white on metathorax. Foreleg and midleg dark brown from coxa to tibia and at apices of tarsomeres, rest of tarsomeres I-III whitish beige, last two tarsomeres greyish brown. Hindleg coxa dark brown on basal half; rest of coxa and femur mottled various shades of brown; tibia pale greyish brown; tarsomeres uniformly beige. Forewing length: 3.9-4.6 mm (holotype: 4.5 mm). Forewing longitudinally divided into beige costal 1/3 and dark brown dorsal 2/3; beige



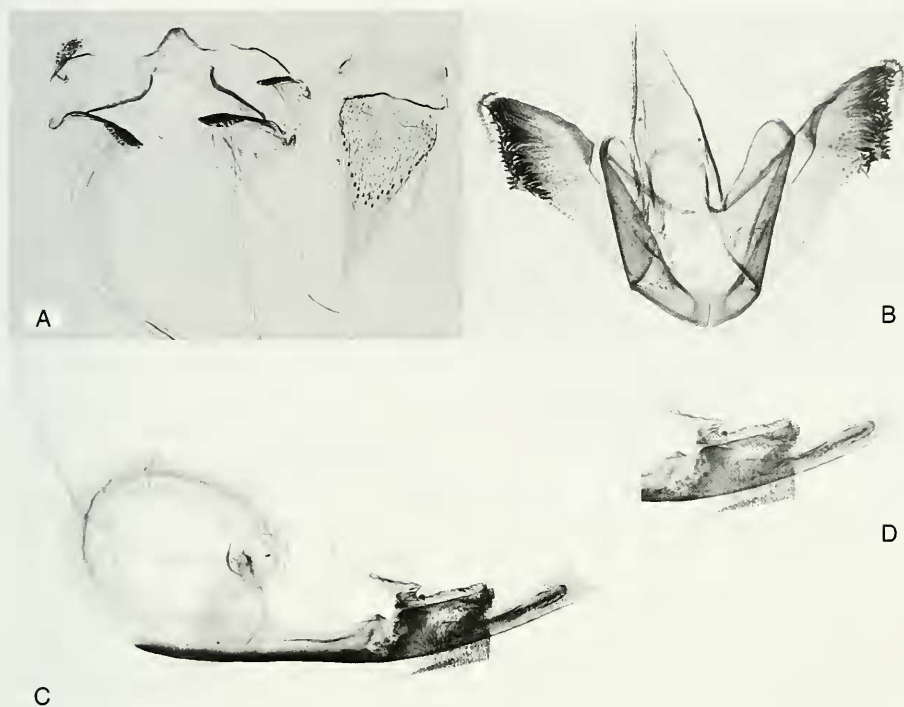


FIG. 17

Male of *Neurostrota magnifica*. A. Abdominal segments VII-VIII; B. Genitalia without phallus; C. Phallus; D. Tip of phallus.

costal band with up to about 15 small dark brown spots on costa from base to  $3/5$ , sometimes with more dark brown scaling, especially toward base, usually with short extension of beige scaling between  $3/10$  and  $4/10$  into dark brown dorsal band; dorsal band with slight purple lustre; fringe mostly greyish beige with wider tipped and darker, greyish brown scales along apical  $1/5$ . Hindwing greyish brown, with fringe greyish beige. Abdomen pale greyish brown dorsally except for shade of beige on genitalia; ventrally basally mottled with various shades of brown, uniformly whitish on last two segments and genitalia. Intersegmental membrane VI-VII slightly shorter than segment VI (Fig. 13). Tergum VII represented by short and very narrow sclerotised band anteriorly. Sternum VII posteriorly with straight and narrow sclerotised band extending laterally into narrower rods as long as main narrow band and directed anteroventrally; this structure followed laterally by pair of tufts of about 50-60 hairlike, apically pointed scent scales mostly about as long as abdominal segments II-III, without transverse median band of fine setulae. Intersegmental membrane VII-VIII about  $1/2$  length of preceding intersegmental membrane, laterally and ventrolaterally on each side with about 50 rocket-shaped scales about 5X longer than their median width on internally short-tailed bulbous scale bases. Tergum VIII with median, sclero-

tised area shaped like inverted T (the longitudinal bar pointing anteriorly) with thick bars. Sternum VIII basally with narrow sclerotised bar extending laterally and produced posteromedially into short, elongate dome; this structure followed laterally by pair of tufts of about 25 hairlike, apically pointed scent scales about half as long as longer scales of anterior tufts; apical margin narrowly sclerotised, especially on each side of slightly produced middle.

Male genitalia ( $n=3$ ) (Fig. 13). Tegumen arms narrow, sclerotised and scaled, apically abutting but not fused, narrower than saccus and about 15% shorter, about 30% shorter than valva. Vinculum arms not differentiated from base of saccus; saccus short and wide, about 15% shorter than valva, lateral margins as high as bases of valvae, gently tapering to flat and narrowly rounded distal end, ventral surface slightly curving upward from beyond middle. Subscaphium projecting beyond tegumen by half of latter's length; with narrow sclerotised band ventrally from base to  $2/3$ , about  $1/4$  width of subscaphium. Transtilla membranous, laterally with short spines, also with setulae. Valva somewhat quadrangular with rounded apical angles, apex about 30% wider than base, with ventral and apical margins straight, with dorsal margin following gentle dorsoapical extension of width; about  $1.6X$  as long as terminal width and  $2.6X$  as long as basal width; ventral margin with short, apically toothed projection directed medially at about  $1/2$ , and usually with minute spine subapically; median surface with narrow, pointed scalelike setae along ventral margin from beyond middle but more thickly concentrated in narrow band along apical margin; shortest, spinelike setae along ventral margin near apex and along apical margin, longest setae slightly more mesally situated, directed anterodorsally, slightly projecting beyond dorsal margin; with few hairlike setae along ventral margin before middle and on median surface subbasally near dorsal margin and more medially; dorsomedian angles with thickly melanised narrow rods projecting anteriorly, about  $0.2X$  length of valva. Phallus narrow, tubular, as long as valva, slightly downcurved, apically separated laterally into short point on right side and small, curved and toothed (with about 10 "teeth" of various sizes) spatular projection on left side, with bulbus ejaculatorius narrow, slightly longer than melanised part of phallus, anteriorly rounded and slightly enlarged; vesica apparently without cornuti or scobination.

FEMALE ( $n=5$ ). Antenna and colour as in male, although with maximum of four scales to pecten in available specimens. Forewing length: 4.4-4.8 mm. Frenulum with two acanthae. Segment VII more thickly melanised than other segments, especially on sternite, but cuticle not wrinkled, also with thicker vestiture, especially along posterior margins and on sternite, with apical margins broadly concave, more deeply so on sternite. Female genitalia ( $n=2$ ) (Fig. 22). Papillae anales laterally compressed, about  $2.7X$  as wide as long, only slightly longer dorsally, ventral and dorsal angles broadly rounded, with long setae in row from basal margin ventrally to middle of dorsal margin, with shorter setae mostly along apical margin, also with minute setulae on whole surface. Posterior apophyses basally about  $1/4$  as wide as width of papillae anales, straight, gently tapering into narrowly pointed apex, reaching about midway into segment VIII. Tergum VIII dorsally and laterally of equal length, about as long as papillae anales, separated from sternum VIII by narrow membranous gap. Anterior apophyses from ventrolateral angles of tergum VIII, without melanised connection

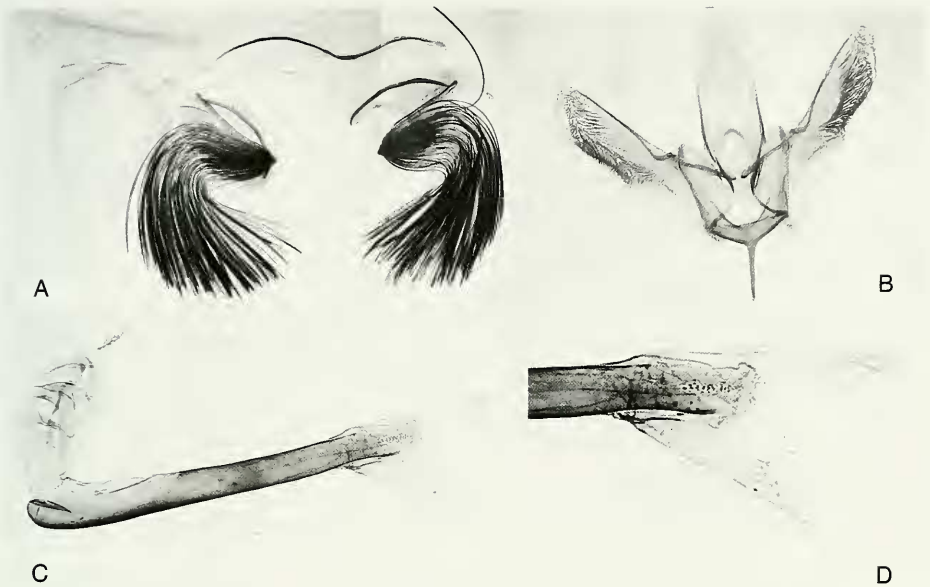


FIG. 18

Male of *Neurostrota brunnea*. A. Abdominal segments VII-VIII; B. Genitalia without phallus; C. Phallus; D. Tip of phallus.

with sternum VIII, narrower but about as long as posterior apophyses. Sternum VIII as pear-shaped plate with truncated tail end, larger anterior section open to accommodate antrum except for thin but thickly melanised and rounded ventral margin. Antrum of ostium bursae thickly melanised, cup shaped. Ductus bursae long and narrow, basal 1/5th smoothly melanised. Inception of ductus seminalis next to ostium bursae. Corpus bursae elongate, gently enlarging to about 4.5X width of ductus at midlength, reaching well into abdominal segment III; pair of long, laterally located, claw-shaped signa with serrated median edge and with bases protruding from corpus wall.

**ETYMOLOGY:** The species' name honours the family of Eliecer (deceased) and Emma Cruz-Bedon for their unwavering involvement in Galapagos conservation.

**BIOLOGY:** I was able to rear one specimen of this species from mined leaves (Fig. 33) of *Galactia* sp. (probably *G. striata* (Jacq.) Urban; Leguminosae; H. Jaeger, pers. comm.). The mined plants were growing on the rim of the Fernandina crater, where all the other available specimens were attracted to light in February. This plant is a native vine on many of the Galapagos islands (Lawesson *et al.*, 1987).

**DISTRIBUTION:** Galapagos island of Fernandina, where it is possibly endemic.

### *Cryptolectica* Vári, 1961.

This is a genus with only five described species in China, Japan, and South Africa (De Prins & De Prins, 2005) for which the host plants are in the Fagaceae (Robinson *et al.*, 2004; De Prins & De Prins, 2005). The new species described below

represents the first record of the genus for the New World and its host plants are in the Asteraceae. The generic assignment of this species was suggested by Don R. Davis (pers. comm.) and agreed upon by Jurate and Willy De Prins (pers. comm.).

*Cryptolectica lazaroï* sp. n.

Figs 5, 14, 23

MATERIAL EXAMINED: Holotype ♂. [1] "ECUADOR/ GALA[with acute accent]PAGOS/ S[an]ta Cruz, Media/ Luna, Pampa Zone/ 8.II.1989, M[ercury] V[apor] L[amp]/ B. Landry". With "ECUADOR" perpendicularly placed on the left margin with respect to the rest of the text. [2] "HOLOTYPE/ *Cryptolectica/ lazaroï*/ B. LANDRY". Specimen in perfect condition although not elegantly spread. Deposited in the CNC.

Paratypes: 15 ♂, 11 ♀ from the Galapagos islands, Ecuador. – *San Cristobal*: 1 ♂, 2 ♀, steps to El Junco, ca. 650 m elev[ation]., 17.iii.2004, hand-picked, 18h00, (B. Landry, P. Schmitz); 2 ♂, 1 ♀, same locality, Ex. *Ageratum conyzoides* leaf, Em. 18.iii.2004; 2 ♂, same locality and host plant, Em. 26.iii.2004. – *Santa Cruz*: 5 ♂ (two dissected, slides BL 1172, BL 1538), 4 ♀, same data as holotype; 1 ♀ (dissected, slide BL 1539), 2 km W Bella Vista, 27.ii.1989, M[ercury] V[apor] L[amp] (B. Landry); 5 ♂ (one dissected, slide BL 1540), 3 ♀ (one dissected, BL 1542), 5 km N Puerto Ayora, 23.xii.2002, Reared on *Synedrella nodiflora* (Leaf miner), 03 CDRS-20 (L. Roque). Deposited in the CDRS, CNC, and MHNG.

Other specimens examined. Five specimens reared on *Synedrella nodiflora*, but without abdomens.

DIAGNOSIS: The forewing markings of *Cryptolectica lazaroï* will separate this species from the other Gracillariidae of the Galapagos. White forewing markings reaching the costa are also present in the *Dialectica* species and *Acrocercops galapagosensis*, but *Cryptolectica lazaroï* does not have the forewing dorsal margin completely white, as in *Acrocercops galapagosensis*, and the dorsal margin's white markings are not large and triangular as in the *Dialectica* species.

DESCRIPTION: MALE (n=16) (Figs 5, 14). Head whitish beige, sometimes with faint touch of greyish brown or chestnut brown, with few dark brown scales around eye along posterior and posteroventral margins, behind antenna, and on ventral half of scale tuft projecting medially over fronto-clypeus, dorsal scales of that scale tuft white. Antenna about as long as forewing (n=2); scape dorsally greyish beige, ventrally dark brown; flagellum dark greyish brown. Haustellum well developed. Maxillary palpus upturned, dark brown at base, with few beige scales dorsally, dark greyish brown on apical segment. Labial palpus drooping; second segment white at base, dark greyish brown on apical half; third segment whitish beige with median, transverse greyish brown band. Thorax with mesoscutum and mesoscutellum pale beige; tegulae dark brown at base, chestnut brown toward apex; apical segments greyish brown, shining. Foreleg coxa pale greyish brown, femur dark greyish brown, tibia dark greyish brown with pair of beige patches ventrally, tarsomeres beige with subbasal and subapical patches of greyish brown on tarsomere I, with median patch of greyish brown on tarsomeres II-III (sometimes also on IV). Midleg as in foreleg except sometimes with more extensive beige scaling on tibia. Hindleg femur pale beige with few dark greyish brown scales medially and apically; tibia pale beige at base with few dark greyish brown scales at base of basal spines, mostly pale greyish brown on apical 2/3; tarsomeres I-IV mostly greyish brown with beige at base and apically, tarsomere I sometimes with beige also near middle, tarsomere V all beige. Forewing length: 2.53-3.56 mm (holotype: 3.23 mm). Forewing colour mostly chestnut brown (one reared spe-



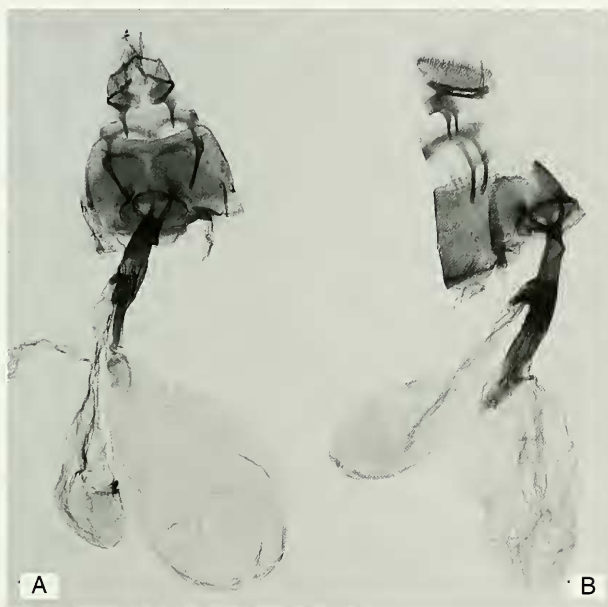


FIG. 19

Female genitalia of *Acrocercops serrigera galapagosensis*. A. Ventral view; B. Lateral view (note distal ends of three spermatophores).

cimen mostly dark brown) with white markings delineated by black (deep dark brown) scales; costa black at base; first costal white marking a small patch at  $1/5$  wing length; second a moderately wide, straight, diagonal stripe beginning at  $2/5$  costa, ending near middle on cubital stem; third a thin line from about  $7/10$  on costa to  $3/4$  on dorsal margin; fourth a thin perpendicular line subapically; dorsal margin with thin white line from base to small white patch at  $1/3$ , followed by line of black scales ending with 2-3 white scales at  $3/5$ ; rest of wing surface chestnut brown; fringe pale grey to greyish-chestnut until  $3/4$ , followed by white, chestnut brown and dark brown, white, chestnut brown and dark brown, and white, with tips of first and second rows of scales dark brown, with third row of scales grey, very thin, and deeply cleft in three. Hindwing greyish brown with fringe slightly paler and tinged with chestnut brown toward apex. Abdomen dark greyish brown. Tergite VIII with longitudinal, median, narrow sclerotised band extending anteriorly as free rod into median segment VII medially. Sternite VIII much narrower than corresponding tergite, narrowing medially from each side and with one small, narrow and thickly sclerotised eye-shaped patch on each side of median line.

Male genitalia ( $n=3$ ) (Fig. 14). Tegumen very lightly sclerotised, about half length of valva and not as wide as valva, undifferentiated from narrower and more thickly sclerotised vinculum with short, bell-shaped saccus. Subscaphium a pair of narrow arms directed upward and joining posterodorsally, with one triangular, submedian projection directed ventrally on each arm and with setae of variable lengths along ventral margin from triangular projection until apex. Valva almost rectangular,

slightly projected and rounded apicodorsally; basal half of lateral surface slightly bulging, with well-spaced, elongate (about as long as genital capsule) hairlike scales; ventral margin with short setae, with tiny point postmedially, and with 8-10 mostly short, apically blunt, thickly sclerotised scalelike setae from middle of ventral margin to base of apical margin; apical margin with narrow band of short setae directed anteromedially; median surface of valvae with few short setae. Phallus a narrow cylinder with slightly enlarged base, about 2/3 length of genital capsule, apex with dorsal margin rounded and extending slightly beyond ventral margin, with short spine ventrally at apex apparently attached to membrane; vesica with tiny, apparently spinelike scobination.

FEMALE (n=11). Antenna and colour as in male. Forewing length: 2.39-3.48 mm. Frenulum simple. Female genitalia (n=2) (Fig. 23). Papillae anales short, with setation of variable length. Posterior apophyses narrow, apically pointed, reaching posterior margin of segment VII. Segment VIII a very narrow band dorsally; anterior apophyses about as long as posterior apophyses and of the same shape. Antrum at posterior margin of sternum VIII medially, with ventral margin rounded and shortly projecting posteriorly. Ductus bursae with distinct well-sclerotised, narrow, dorso-ventrally flattened proximal section reaching almost to anterior margin of segment VII; posterior section membranous, thin and very long (reaching into fourth segment). Corpus bursae shrivelled in dissected specimens, but appearing narrow and short (about as long as segment IV), reaching into segment III; without signum.

ETYMOLOGY: The specific name honours Dr. Lazaro Roque-Albelo, lepidopterist at the Charles Darwin Research Station, who reared part of the type series and contributed greatly to the knowledge of all Lepidoptera of the Galapagos.

BIOLOGY: This species was reared from larvae found mining leaves of *Synedrella nodiflora* (L.) Gartn. and *Ageratum conyzoides* L. (Asteraceae) in the transition and pampa zones, respectively. The first species is an introduced plant known to be present on Isabela and Santa Cruz while *A. conyzoides* is considered native although it is widespread in tropical regions of the world (Lawesson *et al.*, 1987). Specimens were also collected at light in the pampa zone.

DISTRIBUTION: *Cryptolectica lazaro* is known from San Cristobal and Santa Cruz.

REMARKS: It is possible that this species is not endemic given that the known host plants are widespread outside the Galapagos. However, the larvae may also feed on other, endemic Asteraceae. In forewing pattern this species is close to *Acrocercops caementosa* Meyrick, described from Peru, but *A. caementosa* is larger and a dissection of the male paralectotype showed clear differences, such as a simple valva with a small, weakly sclerotised costal projection at base.

### ***Dialectica* Walsingham, 1897**

*Didactica* Tutt, 1900

*Eutrichocnemis* Spuler, 1910

This widespread genus includes 20 species (De Prins & De Prins, 2005) including three in the Neotropical region (Davis & Miller, 1984). The food plants are in the Asclepiadaceae, Boraginaceae, Malvaceae, and Solanaceae (Robinson *et al.*, 2004).

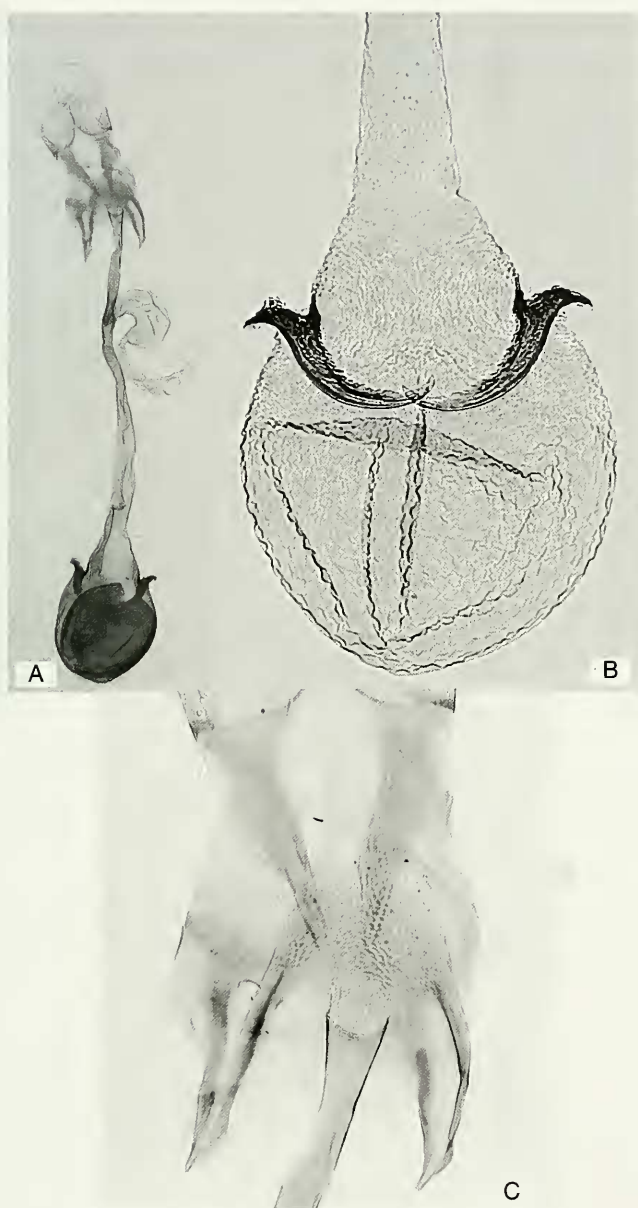


FIG. 20

Female genitalia of *Caloptilia dondavisi*. A. Ventral view; B. Corpus bursae; C. Antrum.

*Dialectica galapagosensis* sp. n.

Figs 6, 15, 24

MATERIAL EXAMINED: Holotype ♂. [1] "ECU[ADOR], GALAPAGOS/ Santiago, Central/ 700 m elev[ation]., 9.iv.1992/ M[ercury] V[apor] L[amp]/ B. Landry". [2] "HOLO-TYPE/ *Dialectica/ galapagosensis/* B. Landry". Specimen complete but with forewings and head slightly rubbed. Deposited in the MHNG.

Paratypes: 28 ♂, 11 ♀ from the Galapagos islands, Ecuador. – *Fernandina*: 2 ♂, SW side, GPS: 815 m elev[ation]., S 00° 21.270', W 091° 35.341', day time, 11.ii.2005 (B. Landry, P. Schmitz). – *Floreana*: 1 ♂ (dissected, slide BL 1559), Cerro Pajas, red de barrido, asociado a *Tournefortia rufo sericeae*, 16.ii.2001 (L. Roque); 1 ♀, Scalesias near Cerro Pajas, GPS: elev. 329 m, S 01° 17.743', W 90° 27.111', u[ltra] v[iolet] l[ight], 12.iv.2004 (P. Schmitz). – *Isabela*: 2 ♂, 1 km W Puerto Villamil, 3.iii.1989, M[ercury] V[apor] L[amp] (B. Landry); 1 ♂, Volcan Darwin, 400 m, UVL - W[ite] L[ight] Trap, 3.iii.2000, LR #2000-07 (L. Roque); 3 ♂ (one dissected, slide BL 1548), 1 ♀, 2 km W Puerto Villamil, 5.iii.1989, MVL (B. Landry); 3 ♂, Volcan Darwin, 300 m, UVL-WL Trap, 6.iii.2000, LR #2000-012 (L. Roque); 1 ♀, Volcan Darwin, 1300 m, UVL-WL Trap, 7.iii.2000, LR #2000-013 (L. Roque); 1 ♂ (dissected, slide BL 1554), 3 km N S[an]to Tomas, Agr[iculture]. Zone, 8.iii.1989, MVL (B. Landry); 2 ♂, 11 km N Puerto Villamil, MVL, 9.iii.1989 (B. Landry); 1 ♂ (dissected, slide BL 1543), 8.5 km N Pto Villamil, MVL, 11.iii.1989 (B. Landry); 1 ♂, NE slope Alcedo, Los Guayabillos camp, GPS: elev. 869 m, S 00° 24.976', W 91° 04.617', uvl, 2.iv.2004, 4h00-5h30 (B. Landry, P. Schmitz); 4 ♂, 1 ♀ (dissected, slide BL 1547), Alcedo, lado NE, 700 m, camp guayabillos, UVL, 16.iv.2002 (B. Landry, L. Roque); 1 ♂ (dissected, slide BL 1174), V[olcan] Darwin, 1240 m elev., MVL, 19.v.1992 (B. Landry). – *San Cristobal*: 1 ♂ (dissected, slide BL 1546), 1 km S El Progreso, MVL, 14.ii.1989 (B. Landry); 1 ♀, transition zone, SW El Progreso, GPS: elev. 75 m, S 00° 56.359', W 89° 32.906', uvl, 15.iii.2004 (B. Landry, P. Schmitz); 1 ♂, near Loberia, GPS: elev. 14 m, S 00° 55.149', W 89° 36.897', uvl, 16.iii.2004 (B. Landry, P. Schmitz); 3 ♀, 4 km SE Puerto Baquerizo, GPS: elev. 169 m, S 00° 54.800', W 89° 34.574', uvl, 17.iii.2004 (B. Landry, P. Schmitz). *Santa Cruz*: 1 ♀ (dissected, slide BL 1544), Barranco, 10 m, S 00° 44'34" W 090° 18'21", MVL Trap, 26.i.2000, LR #2000-01 (L. Roque); 2 ♀, NNW Bella Vista, GPS: 225 m elev., S 00° 41.293', W 090° 19.665', uvl, 18.ii.2005 (B. Landry, P. Schmitz); 1 ♂, low agriculture zone, GPS: S 00° 42.132', W 90° 19.156', uvl, 13.iii.2004 (B. Landry, P. Schmitz); 1 ♂, agriculture zone, finca C. Troya, N Bella Vista, GPS: elev. 294 m, S 00° 40.756', W 90° 18.671', uvl, 9.iv.2004 (B. Landry); 1 ♂, 5 km N Puerto Ayora, Transition Zone, UVL, 17.ix.2001 (L. Roque). – *Santiago*: 1 ♂ (dissected, slide BL 1545), Aguacate, 520 m elev., 6.iv.1992 (B. Landry). Deposited in the BMNH, CDRS, CNC, and MHNG.

Other specimens examined. 4 specimens without abdomens from collection localities of some of the paratypes; 1 specimen of undetermined sex, complete but unpinned, found dead and kept in a gelatine capsule, with the following data: Fernandina, SW side, 815 m [elev.], reared from *Macraea loricifolia*, coll. 15.ii.2005, em[erged]. before 28.ii. 2005 (found dead in cage) (B. Landry).

DIAGNOSIS: The orange forewings and white markings easily separate this species from the other Galapagos Gracillariidae except *Dialectica sanctaecrucis darwini*. In *Dialectica galapagosensis* the apical 1/3 of the forewing is crossed by two transverse white bands while that of *Dialectica sanctaecrucis darwini* has one slender, subterminal, transverse white band connected posteriorly with a larger longitudinal band running along apical 1/4 of dorsal margin.

DESCRIPTION: MALE (n=23) (Figs 6, 15). Head pure white except for few brown and dark brown scales around margin of eye posteriorly and below antennal bases, on ventral half of scale tuft projecting medially over fronto-clypeus. Antenna about 1/4 longer than forewing (n=2); scape laterally beige with dark brown at apex, medially with longitudinal dark brown and white stripes; pedicel dark brown on dorsal edge, greyish brown elsewhere; flagellum uniformly greyish brown. Haustellum well developed. Maxillary palpus porrect, mostly white, laterally with brown on penul-



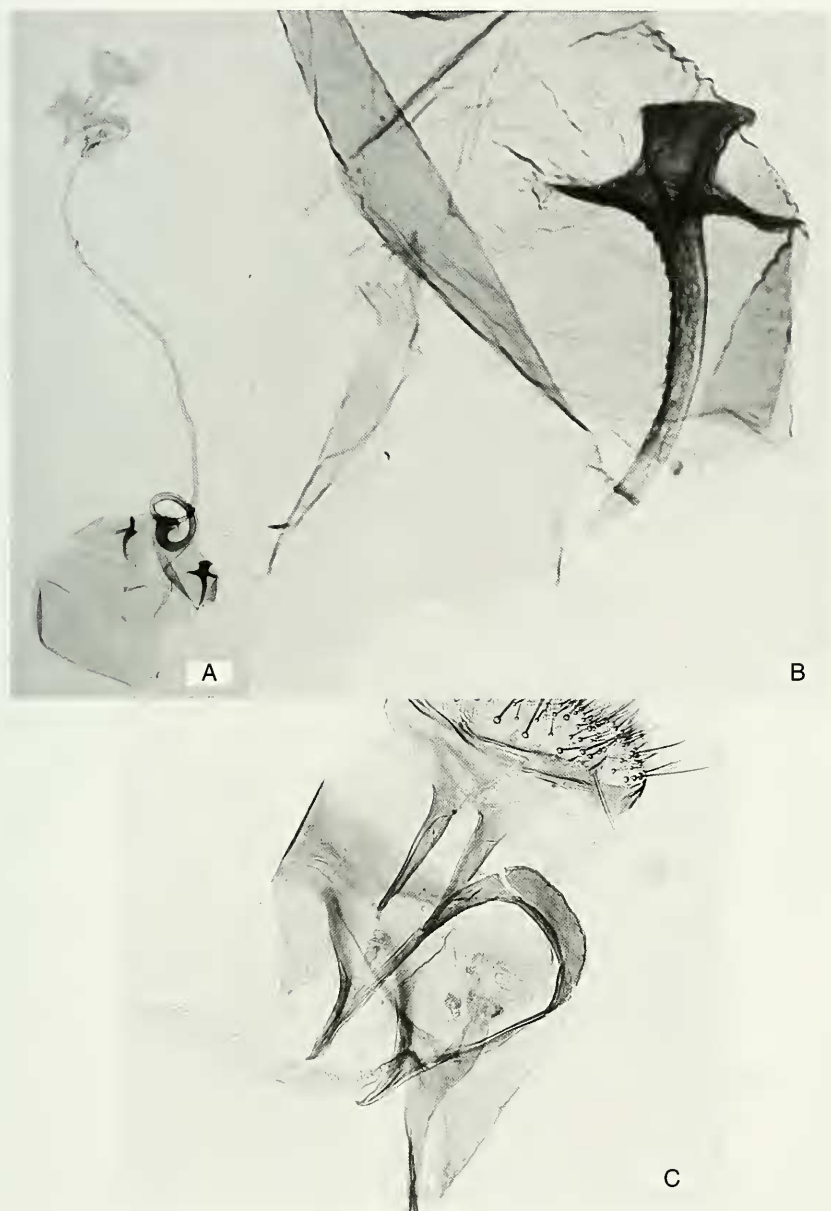


FIG. 21

Female genitalia of *Caloptilia galacotra*. A. Lateral view; B. Signum; C. Antrum.

timate palpomere and dark greyish brown on last palpomere. Labial palpus drooping but with last palpomere slightly upcurved, mostly white, laterally with brown on penultimate palpomere and at base of last palpomere. Thorax white except for orange brown tegulae and shining greyish beige apical segments. Foreleg coxa mostly whitish beige,

with dark greyish brown at apex laterally; femur dark greyish brown; tibia dark greyish brown with pair of white spots medially at base; tarsomeres beige with dark greyish brown laterally at middle of tarsomere I and apices of tarsomeres II-III (sometimes also on IV). Midleg femur mostly beige with dark greyish brown at base and ventral edge; tibia dark greyish brown with pale patches of white and/or beige basally, medially, and subapically; tarsomeres as in foreleg except tarsomere I white instead of beige. Hindleg femur white with small dark brown patch at base and larger one near middle; tibia whitish beige with dark greyish brown patches at base, along middle after first set of spines, and apically; tarsomeres as in midleg except for more prominent darker patches. Forewing length: 2.91-4.15 mm (holotype: 3.92 mm). Forewing colour orange brown with white markings outlined by one-scaled row of dark brown scales; large triangle at 1/4 connected to rather wide band along dorsal margin between base and triangle; second smaller triangle at 1/2 from dorsal margin to above midline where it is sometimes interrupted or becomes a narrow band or narrow inverted triangle reaching costa; rather narrow, medially constricted (sometimes interrupted) transverse band at 2/3, wider at dorsal margin; a very narrow oblique band at 1/5; and a small patch subapically, before short row of dark brown scales; fringe basally greyish brown, with subsequent patches of orange brown, orange beige, pale yellowish white and dark greyish brown. Hindwing greyish brown with fringe yellowish tinged on dorsal side and reddish tinged on costal side. Abdomen dorsally greyish brown, ventrally white with dark brown patches on each sternite anterolaterally. Tergite VII unmodified. Sternite VII with pair of narrow projections almost as long as length of sternite's main surface, pointing posteriorly and set on each side of median line. Tergite VIII greatly enlarged, bell-shaped, as long as united lengths of segments VI and VII, mediobasally with small Y-shaped support structure pointing anteriorly, otherwise lightly sclerotised. Inter-segmental membrane between tergite VIII and genitalia long and folded between tergite VIII and genitalia when latter retracted. Sternite VIII not visible and inter-segmental membranes between sternite VIII and genitalia very narrow.

Male genitalia (n=7) (Fig. 15). Tegumen with very narrow arms only lightly sclerotised, except sometimes at their posterior connection, slightly shorter than valva but slightly wider. Vinculum arms more thickly sclerotised, of medium width, ventral section of same width, with saccus of same width pointing upward at half right angle. Subscaphium with narrow lateral arms only sclerotised near base, slightly longer than tegumen, slightly curved upward on last 1/3, with sparse short setation along ventral margins. Transtilla poorly sclerotised, not differentiated. Valva rather narrow, slightly narrowing toward rounded apex; laterally with basal half slightly bulged and covered with well-spaced, elongate (about as long as valva) hairlike scales; dorsobasal angle, near hinge with vinculum arms, with small bunch of "androconial hairs" joining above tegumen in large, inverted, heart-shaped, elongate (about half as long as valva) "crown" apparently made of such hairs; medial surface with short setation especially along ventral margin and at apex, beyond middle with pair of pectinifers slightly variable in length and curvature. Phallus a narrow cylinder about as long as valva with left wall sharply pointed apically; vesica with numerous short spinelike cornuti.

FEMALE (n=4). Antenna and colour as in male. Forewing length: 3.01-4.15 mm. Frenulum simple. Female genitalia (n=2) (Fig. 24). Papillae anales slightly wider than

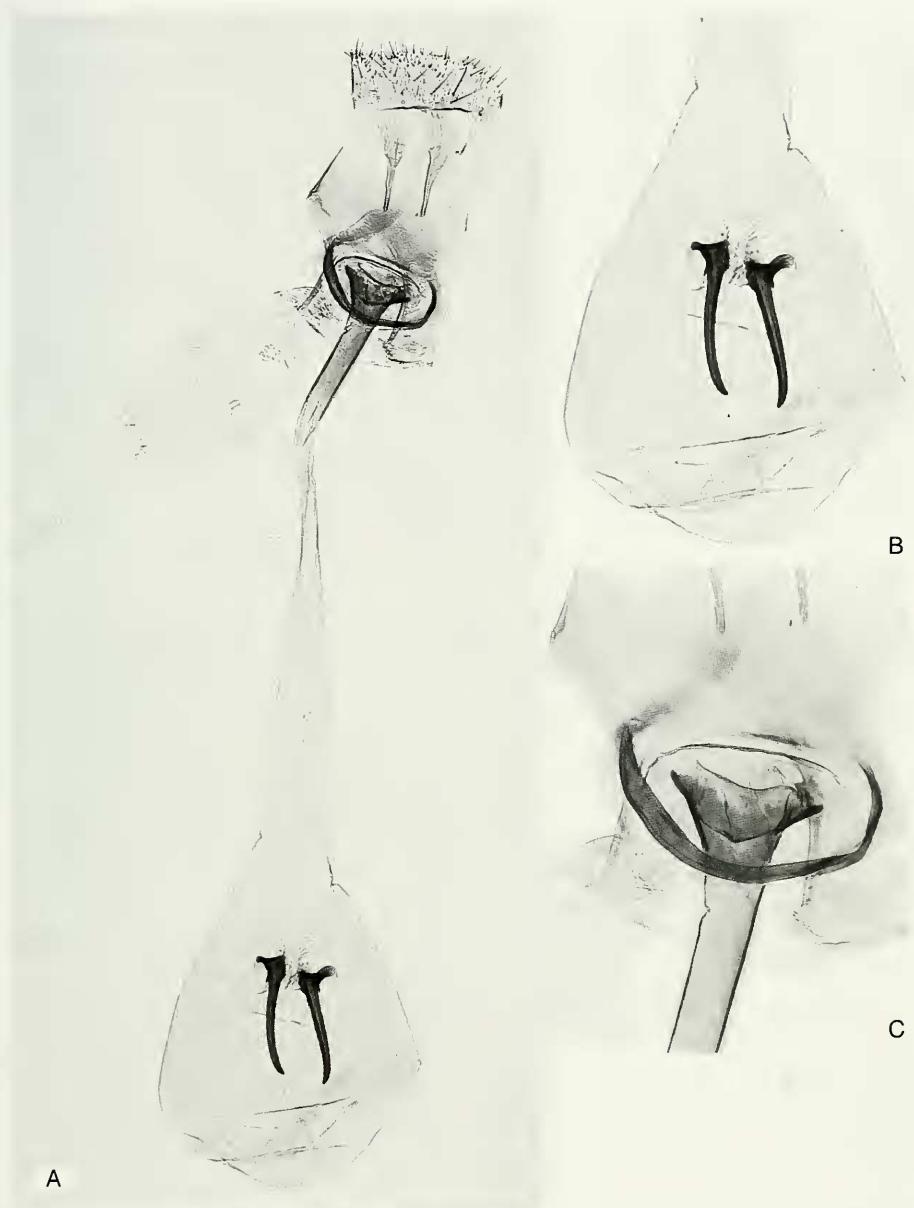


FIG. 22

Female genitalia of *Caloptilia cruzorum*. A. Ventral view; B. Corpus bursae; C. Antrum.

long, rounded apically, with rather abundant and long setation along posterior margin, especially toward apex, and as single row posteriorly along margin of thickly sclerotised basal bar. Posterior apophyses straight, sword-shaped, reaching ostium bursae (or slightly into segment VII). Segment VIII without sclerotised connections dorsally and

ventrally, only with lateral extensions of bases of anterior apophyses. Anterior apophyses with slight (about 30 degrees) angle at 1/4, straight beyond that, narrow but slightly enlarged at angle, slightly narrowing toward rounded apex. Antrum in inter-segmental membrane VII-VIII medially, two narrow sclerotised bands form eye-shaped (in rear view, shaped like low volcano in ventral view) support of ostium set perpendicularly from longitudinal axis of abdomen, this section laterally prolonged by one short sclerotised band on each side and set along longitudinal axis of abdomen. Ductus bursae presumed short (see Remarks below), 1/4 length of corpus bursae, narrow, with short (1/6 of total length) sclerotised section at about 1/3, with longer (about 1/4 total length) narrow, sometimes lightly sclerotised section subterminally, and terminally with pair of bunches of short spines directed toward corpus bursae and with short external projections (Fig. 24C). Ductus seminalis from about 1/3 length of ductus bursae. Corpus bursae long, reaching well into segment III, first section longer, 4X longer than terminal rounded section, slightly enlarging until reaching terminal section at base of which is row of 8-10 ( $n=2$ ) thin, triangular signa directed medio-terminally.

ETYMOLOGY: The species' name refers to the Galapagos archipelago, the area of occurrence.

BIOLOGY: One specimen of this species was found dead in a cage in which I had introduced branches of *Macraea laricifolia* Hook. f. (Asteraceae) collected on Fernandina. I had discovered in 2004 that a species of Gracillariidae was feeding on the thin and short leaves of *M. laricifolia*, but this single specimen is the only one I was able to rear. The host plant is one of the seven genera of angiosperms endemic to the Galapagos. It occurs on all the islands where *D. galapagosensis* has been found, as well as on Pinta and Rabida (McMullen, 1999). The adults of *D. galapagosensis* come to light and were collected from January to May and in September in many habitats, from the coast to the rim of some of the volcanoes (ex. Volcan Darwin at 1240 m in elevation).

DISTRIBUTION: Galapagos islands of Fernandina, Floreana, Isabela (Alcedo, Darwin, Sierra Negra), San Cristobal, Santa Cruz, and Santiago.

REMARKS: With regard to the distinction between ductus and corpus bursae, it could be argued that the corpus bursae is only formed by the terminal rounded structure including the row of triangular signa, but it is not possible to prove either interpretation. In forewing pattern, the presence of two transverse white bands in the apical 1/3 of the forewing was found to be unique among the species of Gracillariidae of the Neotropical region.

*Dialectica sanctaerucis darwini* ssp. n.

Figs 7, 16, 25

MATERIAL EXAMINED: Holotype ♂. [1] "ECU[ADOR]. GALAPAGOS/ Santiago, 200 m elev[ation]/ 5.iv.1992/ M[ercury] V[apor] L[amp]/ B. Landry". [2] "HOLOTYPE/ *Dialectica/ sanctaerucis darwini*/ B. Landry". Specimen not dissected, complete but with forewing fringes not completely spread out. Deposited in the MHNG.

Paratypes: 2 ♂, 11 ♀ from the Galapagos Islands, Ecuador. — *Isabela*: 2 ♀ (one dissected, slide BL 1552), Alcedo, lado NE, 200 m, camp arida alta, u[ltra] v[iolet] l[ight], 14.iv.2002 (B. Landry, L. Roque); 1 ♀ (dissected, slide BL 1236), n[ear] Tagus Cove, 100 m elev[ation].,





FIG. 23

Female genitalia of *Cryptolectica lazaroi*. A. Ventral view; B. Genitalia excluding most of ductus bursae and corpus bursae.

21.v.1992, MVL (B. Landry); 2 ♀, Tagus Cove, 13.v.1992 (B. Landry); 1 ♂ (dissected, slide BL 1553), V[olcan]. Alcedo, zona arida baja, U[ltra]V[iolet] - F[louorescent] L[ight], 12.x.1999 (L. Roque). - *Marchena*: 1 ♀ (dissected, slide BL 1549), Playa Negra, N0018.089' W09030452, 7.iv.2002, UVL (L. Roque). - *Santa Cruz*: 1 ♀ (dissected, slide BL 1550), E[stacion]. C[ientifica]. C[harles]. D[arwin]., 7.iii.1992 (B. Landry); 1 ♀, CDRS, wall of Invertebrates Lab[oratory], GPS: elev. 11 m, S 00° 44.478' W 90° 18.132', 6.iv.2004, uvl, (B. Landry, P. Schmitz). - *Santa Fe*: 1 ♀, tourist trail, 28.v.1992 (B. Landry). - *Santiago*: 1 ♀, Cerro Inn, 28.iii.1992, MVL (B. Landry); 1 ♀, Bahia Espumilla, 4.iv.1992, MVL (B. Landry); 1 ♂ (dissected, slide BL 1551), same data as holotype. Deposited in the BMNH, CDRS, MHNG, and USNM.

Other specimens examined. Holotype of *Dialectica sanctaecrucis* Walsingham. Contrary to the description, the type is a female. The forewing length is 3.23 mm. The specimen (Fig. 30) is deposited in the BMNH and is in good condition except for the broken antennae. The first (circular) label (Fig. 30 B) has a red border.

**DIAGNOSIS:** See above Diagnosis for *Dialectica galapagosensis*. In addition, a distinct pecten on the scape and dark brown scaling on the fronto-clypeus are present in both sexes of *Dialectica sanctaecrucis darwini* while these features are absent in *Dialectica galapagosensis*.

**DESCRIPTION:** MALE (n=3) (Figs 7, 16). Head pure white except for dark brown scaling along posterior margin of eye, on fronto-clypeus as triangular patch from dorsal margin to below middle, and forming tuft below antenna that projects medially over fronto-clypeus. Antenna about 1/4 longer than forewing (n=1); median surface of scape dark brown, lateral surface white on dorsal half ventrally, pale greyish brown to brown (darker toward apex) on ventral half and with distinct white or beige apical pecten of few scales projecting over pedicel; pedicel dark brown laterally, greyish brown

dorsally; flagellomeres uniformly greyish brown. Haustellum well developed. Maxillary palpi porrect, mostly white, with brown scaling laterally on penultimate palpomere and sometimes apically on last palpomere. Labial palpus drooping but with last palpomere slightly upturned, mostly white, with brown scaling laterally and apicoventrally on second palpomere and at base of third palpomere ventrally and laterally. Thorax mostly white with tegulae brown to orange brown from base to apex, with distal segment greyish beige and shining. Foreleg coxa white with brown on apical scales; femur brown; tibia dark brown with white patch laterally at base; tarsomeres white except for pale brown patches medially on tarsomeres I-III. Midleg coxa white with brown at apex; femur beige on dorsal edge and laterally, brown ventrally; tibia dark brown with extensive white patch medially and smaller one subapically; tarsomeres mostly white with pale brown at least on second tarsomere. Hindleg coxa white with brown subapically; femur white with small brown patch medially; tibia pale beige with brown on basal half and dark brown at apex; tarsomeres pale beige with brown on tarsomeres I and II. Forewing length: 3.0-3.14 mm (holotype: 3.05 mm). Forewing colour orange brown with white markings outlined with one-scaled row of dark brown scales; large triangle at 1/4 connecting with costa and with base at dorsal margin; second triangle at 1/2 slightly smaller and also connecting with costa; third marking at 4/5 a distally slanted triangle between dorsal margin and midline, connected on dorsal margin apically with narrow white line from 9/10 on dorsal margin to about 4/5 on costal margin; apically with white patch at base of apical fringe; fringe basally greyish brown followed by orange brown, with white at 4/5 followed by dark brown and apically with scales white at their bases and dark brown at their apices. Hindwing greyish brown with concolorous fringe. Abdomen dorsally and around genitalia greyish brown, ventrally white with pale brown along midline at apical margins of sternites II-V. Tergite VII unmodified. Sternite VII (Fig. 16A) with basal sclerotised margin slightly projected anteriorly in middle; posterior margin more strongly sclerotised into wide but narrow projection shaped like pair of rounded bumps with shallow emargination in middle. Tergite VIII greatly enlarged, about as long as length of tergites V-VII combined, bell-shaped, with basomedian V-shaped sclerotised structure with base projecting anteriorly into segment VII. Intersegmental membrane between tergite VIII and genitalia also very long, folded on top of genitalia when latter retracted. Sternite VIII undetected and associated intersegmental membranes very narrow.

Male genitalia (n=2) (Fig. 16). Tegumen and subscaphium as in *Dialectica galapagosensis* but narrower and slightly longer than valva. Vinculum as in *D. galapagosensis* except saccus slightly slenderer and shorter. Transtilla as in *D. galapagosensis*. Valva as in *D. galapagosensis* but narrower on distal half, with slightly more compact and extensive covering of long and narrow (slightly shorter than genital capsule but extending posteriorly beyond anus), but not all hairlike, scales on basal half laterally, with longer second pectinifer (about twice as long as first pectinifer), and with dorsal "crown of androconiae" shorter than valva and with only few long scales on each side loosely joined on their apical half. Phallus a narrow cylinder slightly shorter than valva, with left wall forming point apically, with slightly narrower and longer bulbus ejaculatorius than in *D. galapagosensis*; vesica with narrow row of cornuti appearing spinelike.

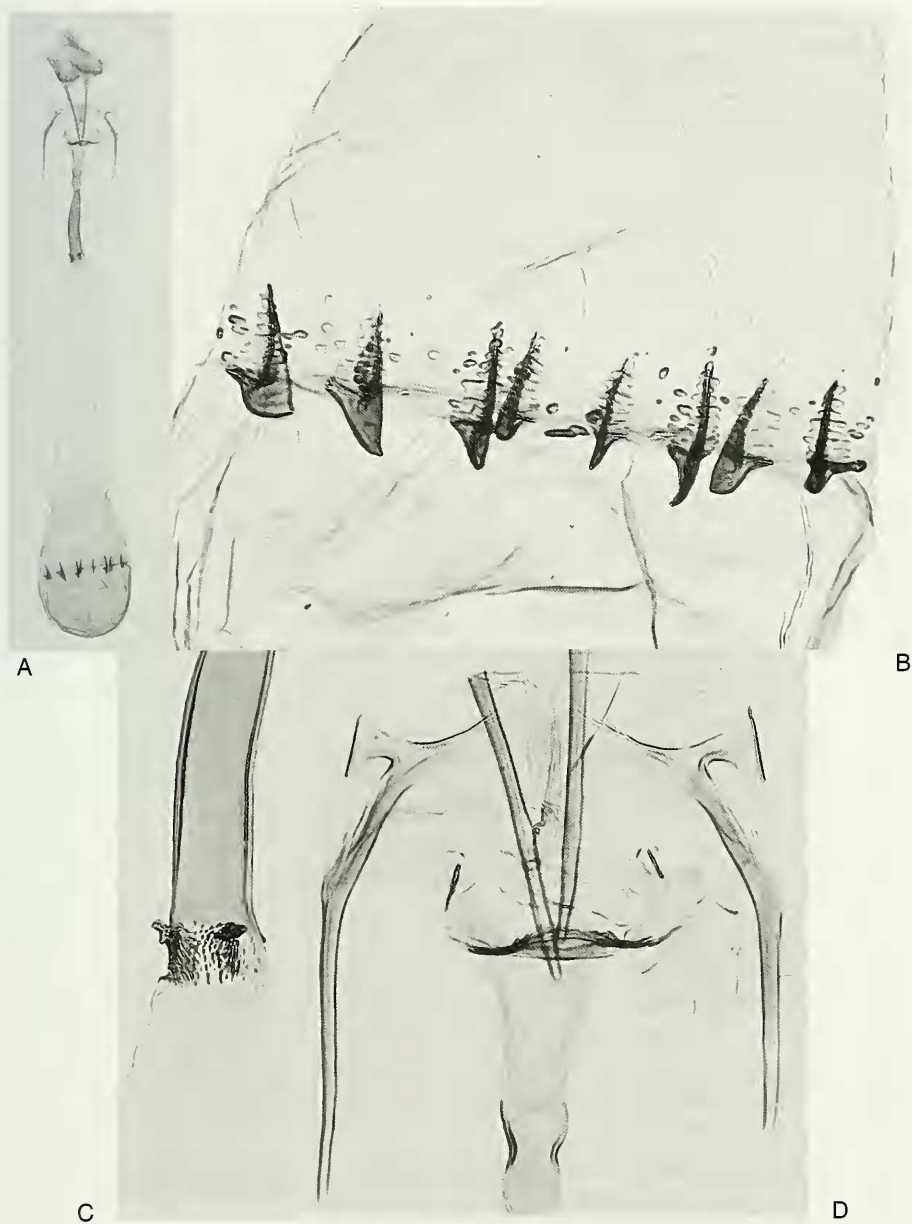


FIG. 24

Female genitalia of *Dialectica galapagosensis*. A. Ventral view; B. Signa; C. Section of ductus bursae; D. Antrum.

FEMALE (n=11). Antenna and colour as in male. Forewing length: 2.77-3.55 mm. Frenulum simple. Female genitalia (n=4) (Fig. 25). Papillae anales and posterior apophyses as in *D. galapagosensis* except slightly shorter. Segment VIII without sclerotised connections dorsally and ventrally, but with rather extensive sclerotised area encompassing unsclerotised circular "hole" at base of anterior apophyses. Anterior apophyses slightly curved, reaching slightly into segment VII, apically pointed. Ostium bursae in intersegmental membrane VII-VIII medially, without differentiated antrum. Ductus bursae narrow and long (slightly longer than combined lengths of anterior and posterior apophyses), with small sclerotised plate close to ostium bursae, with scobination from 1/8 to 1/2, and with rosette of cornuti in wall at terminal end. Ductus seminalis from about 1/8 length of ductus bursae. First section of corpus bursae as narrow and long as ductus bursae, second section rounded with diameter about 2/3 length of first, linear section, reaching into segment IV, without signum.

ETYMOLOGY: Dedicated to Charles Darwin, eminent Galapagos visitor in 1835.

BIOLOGY: Unknown except that moths come to light, were usually found below 200 meters elevation, and fly in March, April, May, and October.

DISTRIBUTION: On the Galapagos islands of Isabela (Alcedo, Darwin), Marchena, Santa Cruz, Santa Fe, and Santiago.

REMARKS: In forewing pattern *D. sanctaecrucis darwini* is similar to *D. sanctaecrucis sanctaecrucis* Walsingham, described from the Virgin Islands, but while the white forewing markings are clearly separated on the dorsal margin in *D. sanctaecrucis darwini*, they almost touch each other in *D. s. sanctaecrucis*. I believe that these differences warrant the recognition of a different subspecies for the Galapagos populations of *D. sanctaecrucis*. Both taxa are similar in size and also share the presence of brown scaling on the fronto-clypeus and a brown pecten on the scape. The genitalia of the type of *D. s. sanctaecrucis* are not clearly distinguishable from those of *D. sanctaecrucis darwini* except that the ductus and corpus bursae appear 12-20% longer in the dissected specimens of *D. sanctaecrucis darwini*. However, the female genitalia may not vary as much as the males' and may not have very distinct diagnostic characters between closely related species. There remains the possibility that *D. sanctaecrucis darwini* and *D. s. sanctaecrucis* are different species, but on the face of their similar wing and head markings and female genitalia, I think this is not the case. It is also possible that the Galapagos populations do not represent a valid subspecies, but a clear answer to this question will require more material from many other areas and is beyond the scope of this study.

In the BMNH I also dissected a male specimen collected in Jamaica (slide BM 29525) and placed with *D. sanctaecrucis*. However, this specimen has pure white fronto-clypeus and scape, the white markings on the forewing are clearly disconnected, much as in *D. sanctaecrucis darwini*, but the thin, subterminal, transverse white band is longer than its associated, dorsal margin white band while it is shorter in *D. sanctaecrucis darwini*, and the dorsal margin white band is reduced in the Jamaica specimen. Differences in genitalia are also significant in that *D. sanctaecrucis darwini* has a larger tegumen and subscaphium, a more slender saccus of the vinculum, a more slender valva on distal half with longer pectinifers, a larger surface cover of large scale





FIG. 25

Female genitalia of *Dialectica sanctaecrucis darwini*. A. Lateral view; B. Section of ductus bursae; C. Antrum, proximal end of ductus bursae, and apophyses.

sockets on the basal half of the valva, and a crown of androconiae which is absent in the specimen from Jamaica. In conclusion, the male specimen from Jamaica is clearly not conspecific with *D. sanctaecrucis darwini* nor with the type of *D. sanctaecrucis* based on external characters, and the male genitalia of *D. s. sanctaecrucis* remain to be characterised. The same general pattern of wing colours and markings is also present on *Dialectica pyramidota* (Meyrick), but the genitalia are clearly different (see Vári, 1961).

Meyrick (1915) mentioned that *D. sanctaecrucis* was a synonym of *Gracilaria* [sic] *nolckeniella* Zeller, 1877, but this is very doubtful. The two syntypes of *D. nolckeniella* examined were about twice the wingspan of the average *D. sanctaecrucis darwini* and their forewings have more extensive white markings (Fig. 31). The first two forewing white patches of *D. nolckeniella* are broadly contiguous with the costa, the terminal dorsal margin white patch is apically associated with a linear white patch extending along the costa and anteriorly enlarged, and there is a distinct apical white patch.

### *Neurostrota* Ely, 1918

This genus is recorded to have two species by De Prins & De Prins (2005). However, Davis *et al.* (1991) mentioned that *Neurostrota pithecolobiella* Busck is not congeneric with *Neurostrota gunniella* (Busck), the type species of the genus. Davis *et al.* also mention two undescribed species from Puerto Rico and Mexico. The larvae of two of the species discussed by Davis *et al.* are stem borers in Leguminosae (Inga,

*Mimosa*, and *Neptunia*). *Neurostrotta gunniella* was introduced in Australia in 1989 for the control of *Mimosa pigra* L. (Davis *et al.*, 1991).

*Neurostrotta magnifica* sp. n.

Figs 8, 17, 26

MATERIAL EXAMINED: Holotype ♂. [1] "ECU[ADOR], San Cristóbal/ 4 km S[outh] E[ast] Puerto Baquerizo/ GPS: elev[ation]. 169 m, 17.iii.2004/ S 00° 54.800' W 89° 34.574'/ u[ltra] v[iolet] l[ight], leg[it]. B[ernard]. Landry, P[atrick]. Schmitz". [2] "HOLOTYPE/ *Neurostrotta magnifica*/ B. Landry". Specimen in perfect condition. Deposited in the MHNG.

Paratypes: 2 ♂, 16 ♀ from the Galapagos Islands, Ecuador. – *San Cristobal*: 1 ♂ (dissected, slide BL 1586), 1 ♀, same data as holotype. – *Santa Cruz*: 1 ♀ (dissected, BL 1584), Finca Vilema, 2 km W Bella Vista, 1.iv.1992, M[ercury]. V[apor]. L[amp]. (B Landry); 1 ♂, 14 ♀ (one dissected, slide BL 1599), agriculture zone, ca. (NNW) Bella Vista, GPS: elev. 223 m, S 00° 41.297' W 90° 19.670', 7.iv.2004, u[ltra] v[iolet] l[ight], leg. B. Landry (BMNH, CDRS, MHNG, USNM).

Other specimen examined. One specimen of undetermined sex with only the head (dissected, slide MHNG 3021), prothorax, and forewings remaining, the rest having been eaten by ants, with the following data: San Cristobal, La Toma, ca. 5.6 km east El Progreso, GPS: 299 m elev., S 00° 55.356' W 089° 31.089', uvl, 23.ii.2005 (B. Landry).

DIAGNOSIS: The combination on the forewing of three white markings on the dorsal margin with the orange brown ground colour will separate *N. magnifica* easily from other Galapagos Gracillariidae species. This species and the other species of *Neurostrotta* of the Galapagos (*N. brunnea*), described below, are the largest among the Galapagos members of this family and have the longest antennae. The two *Neurostrotta* species have the most similar forewing features among Galapagos Gracillariidae, but the forewing ground colour of *N. brunnea* is dark brown, its dorsal cream-colored band is interrupted only once postmedially, and it has a distinct white oblique bar on costa at 3/5. The type species of *Neurostrotta*, *N. gunniella* has the dorsal band white, thinner, and uninterrupted, and an oblique white bar from costa at 2/3; its male genitalia are most similar to those of *N. magnifica* in the shape of the valva and phallus although there is no projection on the anal angle of the valva and the vinculum has a short sacculus; its female genitalia are closer to those of *N. brunnea* in shape of antrum, but the ductus bursae is much shorter and the signa much less conspicuous (see Davis *et al.*, 1991).

DESCRIPTION: MALE (n=3) (Figs 8, 17). Head smooth scaled; scales narrow, projecting anteriorly on vertex and sides of frontoclypeus, projecting posteriorly and medially on posterior margin of occiput; forming wide white band medially from margin of occiput to margin of fronto-clypeus, laterally orange brown to greyish brown with bronze lustre. Antenna about 1.7X length of forewing (n=1); smooth scaled, with single row of slender scales encircling each flagellomere and reaching slightly over base of following flagellomere; scape without pecten, orange brown and dark greyish brown with bronze lustre; pedicel and flagellum orange brown with lustre. Haustellum about 1.85X length of labial palpus. Maxillary palpus about 0.55X eye height, white medially, brown laterally. Labial palpus slender, drooping with distal palpomere pointing upward and anteriorly (at about 45 degrees), with ratio of palpomeres from base 1: 1.3: 1.9, about 1.9X eye height, white medially, laterally white except for greyish brown on first palpomere and pale orange brown on second palpomere and apex of third palpomere. Mesothorax medially with wide white band, basally and laterally

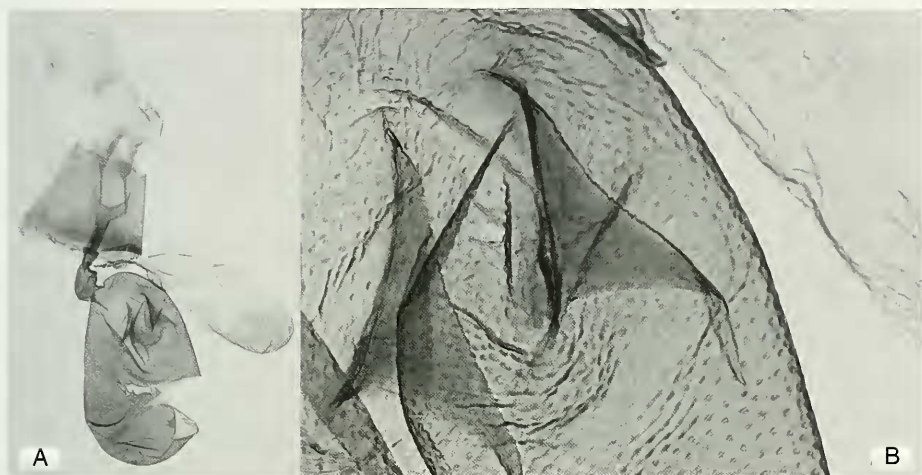


FIG. 26

Female genitalia of *Neurostrota magnifica*. A. Ventral view; B. Signa.

shining orange brown with greyish brown at bases of tegulae; metathorax medially with thin white line, apically and laterally shining greyish white. Foreleg coxa white with orange brown subapically; femur orange brown; tibia orange brown to dark greyish brown toward apex with paler orange brown patch medially; tarsomeres dark greyish brown with white lateroapically. Midleg femur pale orange brown; tibia orange brown with bronze patch before middle and dark brown apically; tarsomeres white with orange brown at middle of tarsomere I and bases of tarsomeres II and III, and greyish brown on tarsomere V. Hindleg coxa orange brown to brown medially, white in middle, pale orange brown laterally; femur white and pale yellowish beige with dark brown patch submedially; tibia with double row of stiff spinelike scales on dorsal edge, pale orange brown becoming darker orange brown at apex and white apically; tarsomere I orange brown basally and subapically, dark brown subbasally and apically, white at middle; tarsomere II dark brown at base and apex, white at middle; tarsomere III dark brown basally, white on distal half; tarsomere IV white; tarsomere V greyish brown. Forewing length: 3.75-4.25 mm (holotype: 4.25 mm); vestiture on costal half greyish brown to 1/2 wing length, followed by rather wide orange brown diagonal bar reaching midline, narrower greyish brown diagonal bar including few paler scales and reaching midline, equally narrow orange brown diagonal bar, thinner, diagonal, shining silver (with blue or purple tinge) band not reaching midline, rather broad apical orange brown patch turning darker brown at tornus and apex, and thin dark brown marginal line from tornus almost to apex; dorsal half basally with small white patch not reaching midline, followed by brown area greyish along midline turning to orange brown toward margin (sometimes with white 1-scale line on margin), elongate triangular white patch reaching midline and 2/5, orange brown area from 2/5 to 1/2, elongate white patch from 1/2 to 3/4 but not reaching midline, narrow, diagonal, shining silver band reaching middle and opposite similar costal band, and dark orange



brown at tornus; fringe on dorsal margin long, hairlike, greyish brown to tornus, on tornus with short brown and long, thin white scales, beyond tornus with short blackish brown scales with blue or purple lustre, and longer bicoloured scales mostly white with apical enlarged section brown, forming long tuft just beyond tornus, but shortening toward apex, at apex with dark brown to bronze brown tuft, followed on distalmost sector of costa with rather long white and greyish brown scales. Hindwing with secondary pseudofrenulum at termination of Sc + R1; frenulum simple; vestiture greyish brown with concolorous fringe. Abdomen dorsally pale greyish brown; ventrally white with orange brown stripe on each sternum laterally in diagonal from middle of sternum to lateral edge. Sternite VII (Fig. 17) a very thin sclerotised band medially forming medium-sized truncated V pointing anteriorly, ending on pleura anteriorly from small narrow plate of few very thin and flimsy scent scales of moderate length. Tergite VII a lightly sclerotised narrow band, about 1/4 length of segment VII. Sternite VIII a pair of narrow sclerotised bars on each side, not connected medially, slightly curved, laterally ending at elongate plates of very long and flimsy scent scales, with about 10 shorter ogival scales about as long as plate section covered with scale sockets (transparent and thus invisible on Figure).

Male genitalia (n=1) (Fig. 17). Tegumen's narrow arms straight, forming inverted elongate V narrowly connected at apex, almost reaching tips of valvae; also with narrow, well sclerotised, broadly rounded bridge from dorsobasal angles, reaching 1/3 length of arms. Vinculum arms greatly enlarged and extended dorsoposteriorly to 3/4 length of valva, laterally shaped like elongate triangle with rounded apex; ventral connection of medium length, about 1/3 length of dorsal margin of arm; without saccus. Subscaphium lightly sclerotised, without setae, reaching about 2/3 length of tegumen in single dissected specimen. Anellus membranous, with numerous short spines and few longer setae. Valva narrow at base, widening along side of vinculum arm, until about half its length; with narrow rod at dorsomedial connection with vinculum arm, extending anteriorly to anterior margin of vinculum arm; apical half of valva with dorsal and ventral margins parallel-sided, in continuation with corresponding margins of vinculum arms, dorsal margin with thickly sclerotised band; apical margin forming about 45-degree angle with dorsal margin; apicoventral angle slightly projected with short but narrow and pointed thickly sclerotised setae; lateral surface of valva on dorsal half "extended beyond" median surface to form unsclerotised flange with short scales and thin setae; median surface of valva on second half mostly with short spine-like pointed setae along ventral and apical margins to moderately long and less thickly sclerotised setae toward dorsal margin, also with longer and thinner pointed scales along midline and between 1/5 and 2/5 of length. Phallus thin, slightly curved, about 1/8 shorter than valva, well sclerotised mostly along ventral margin, but dorsally also at connection with anellus, without coecum penis; vesica with minute spines, better sclerotised longitudinal band apically probably part of phallus wall.

FEMALE (n= 16). Forewing length: 4.5-5.0 mm. Antenna and colour as in male. Frenulum with 2 acanthae; secondary pseudofrenulum present, but number of acanthae not investigated. Segment VI more thickly sclerotised than previous segments, especially medially and laterally towards apex. Segment VII evenly sclerotised except for more thickly sclerotised basal margins of tergum and sternum. Female genitalia (n=2)



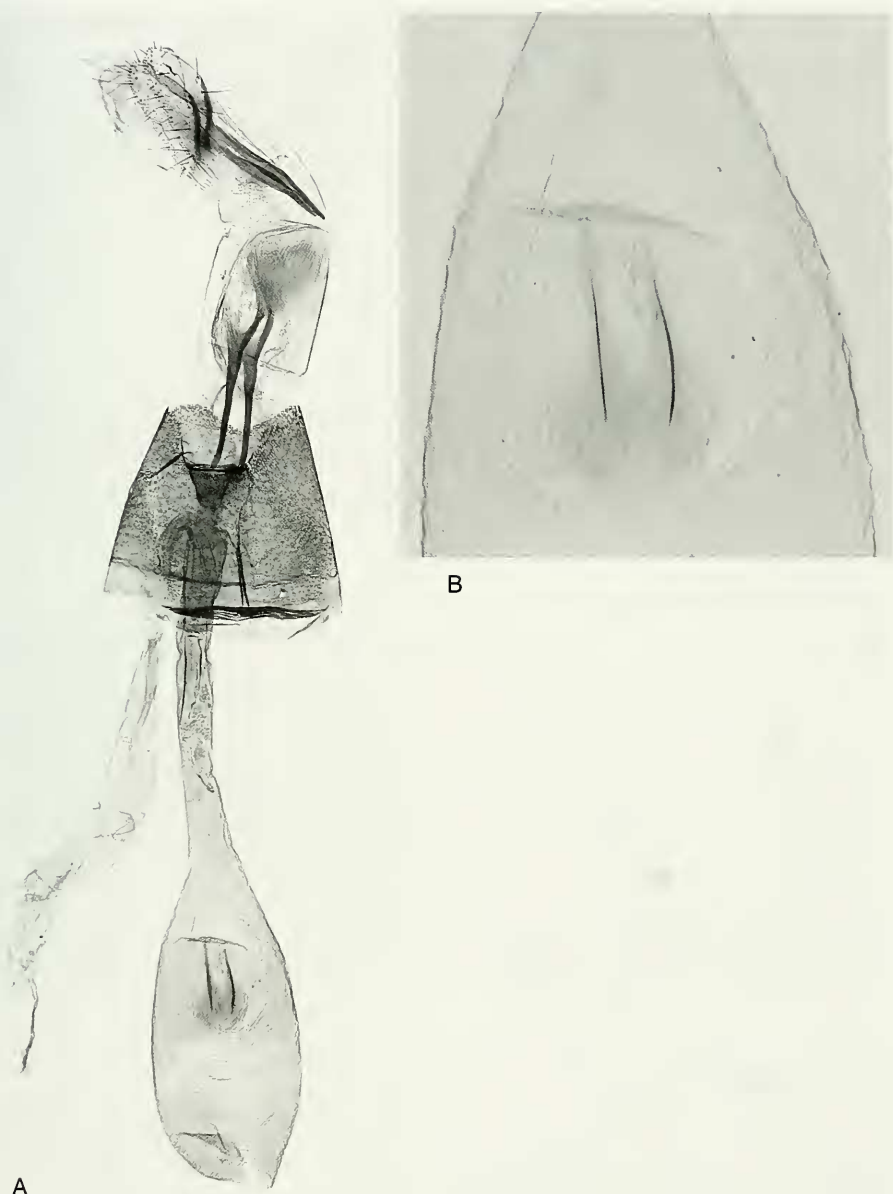


FIG. 27

Female genitalia of *Neurostrota brunnea*. A. Ventral view; B. Signa.

(Fig. 26). Papillae anales weakly sclerotised, not connected dorsally, shaped like narrow right-angle triangles with rounded apex, with short setation mostly along apical margin, and few longer setae along narrow sclerotised bar of basal margin, also with microsetae. Posterior apophyses with weakly sclerotised base, slightly widened beyond

midlength then gently tapering to apex, straight, slightly longer than sclerotised basal margin of papillae anales. Segment VIII moderately sclerotised, short (about 1/3 length of segment VII), not connected ventrally; anterior apophyses with narrow bases and subbasal enlargement associated with short ventral arm, apical half rather narrow, 5/8 length of posterior apophyses. Antrum medially located along emarginated apex of sternum VIII, at middle of sternum, forming shallow bowl with slightly concave, reinforced ventral margin; cuticle posterior antrum with thin perpendicular striae. Ductus bursae short, slightly shorter than segment VII, of moderate girth, with basal 1/4 smoothly sclerotised all around, with thickly sclerotised longitudinal bar ventrally from 1/4 to 1/2, distal half slightly widening, covered with scobination except distally, before connection with corpus bursae. Inception of ductus seminalis just beyond middle of ductus bursae, ductus seminalis with associated large sac. Corpus bursae oblong, with short bump subdistally, about twice as long as ductus bursae, reaching into segment IV, with subbasal pair of thin, triangular, and apically thinly pointed signa laterally, with scobination on whole surface.

**ETYMOLOGY:** From the Latin and meaning splendid, in reference to the forewing colours and pattern of this beautiful species.

**BIOLOGY:** Unknown except that moths were attracted to light in March, April, and November in forested landscapes of agriculture areas between 169 and 299 meters in elevation. Given the biology of the related species, this species could also be a stem borer in Leguminosae.

**DISTRIBUTION:** Galapagos islands of San Cristobal and Santa Cruz.

**REMARKS:** I dissected the head of one specimen of this species and found that with an interocular index of 1.7 its eyes were distinctly larger than those of *N. gunniella*, for which this measurement was reported to be 1.1 (Davis *et al.*, 1991). The labial palpus of *N. magnifica* is also shorter in comparison to the vertical diameter of the eye (1.9X vs. "over 2X"), perhaps as a direct consequence of the larger eyes of *N. magnifica*.

### *Neurostrota brunnea* sp. n.

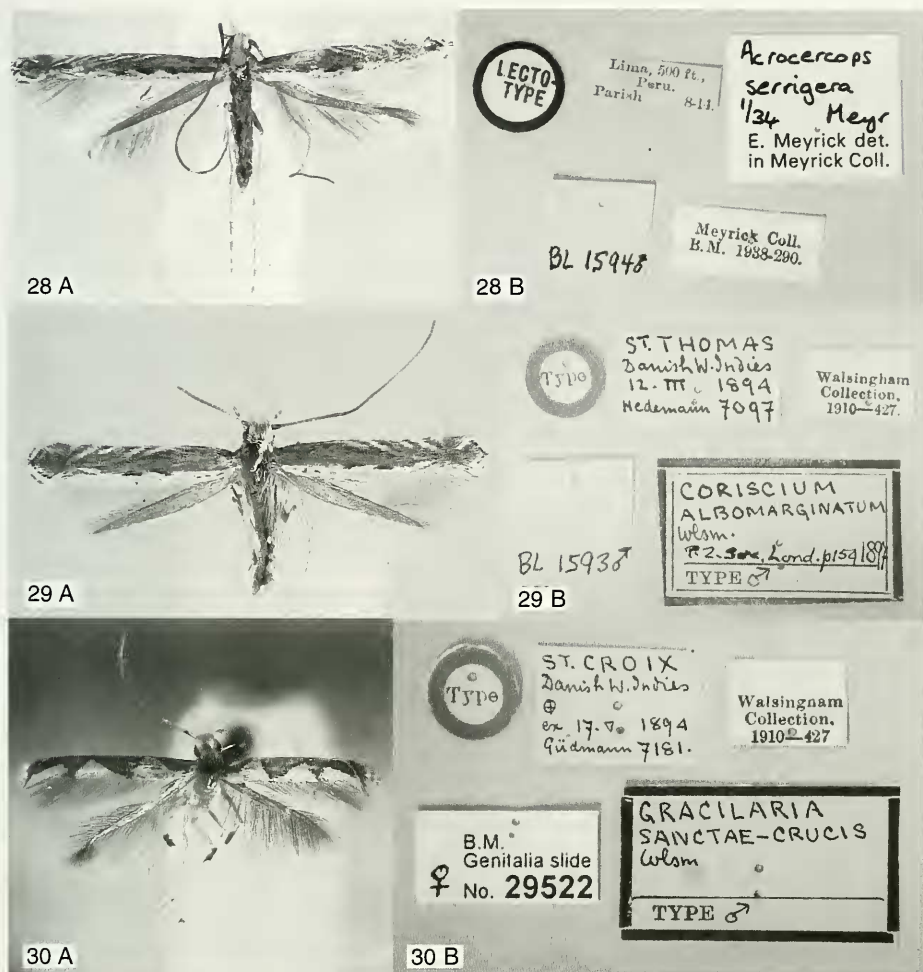
Figs 9, 18, 27

**MATERIAL EXAMINED:** Holotype ♂. [1] "ECU[ADOR].., Galápagos, San Cristóbal/ Hacienda El Cafetal, day time/ on coffee leaves, 22.ii.2005/ leg[it]. B[ernard]. Landry". [2] "MHNG/ Prépar[ation]. Micr[oscopique]/ No 3015 ♀". [3] "HOLOTYPE/ *Neurostrota brunnea*/ B. Landry". Specimen with the left antenna and forewing in a gelatine capsule attached to the pin. Deposited in the MHNG.

Paratypes: 1 ♂, 3 ♀ from the Galapagos Islands, Ecuador. – *San Cristobal*: 1 ♀, same data as holotype; 1 ♂ (dissected, slide BL 1591), Sola bon Cafetal, maíz, café, luz, 27.xi.2003 (A. Miele, P. Lincango). – *Santa Cruz*: 2 ♀ (one dissected, MHNG 3015), NNW Bella Vista, GPS: 225 m elev[ation]. S 00° 41.293' W 90° 19.665', 18.ii.2005, u[ltra] v[iolet] l[ight], B. Landry & P. Schmitz (BMNH, CDRS, MHNG).

Other specimen examined. One specimen of undetermined sex without abdomen, with the right wings mounted on slide (BL 1590), and with the same data as the male paratype (CDRS).

**DIAGNOSIS:** This species is unique among Galapagos Gracillariidae by virtue of the dark brown ground colour of the forewing, the cream-colored longitudinal band along the dorsal margin interrupted once postmedially, and the small, white diagonal bar on costa at 3/5.



FIGS 28-30

Types of Gracillariidae species related to some Galapagos taxa. 28. Lectotype of *Acrocerops serrigera* Meyrick, A. Specimen, B. Labels; 29. Holotype of *Coriscium albomarginatum* Walsingham, A. Specimen, B. Labels; 30. Holotype of *Dialectica sanctaerucis* Walsingham, A. Specimen, B. Labels.

DESCRIPTION: MALE (n=2) (Figs 9, 18). Head mostly cream-colored, with some ochreous scales laterally on occiput and greyish brown to dark brown scales on frontoclypeus along eye margin below antenna, along posterior margin of eye, and at lateral corners of posterior occipital margin. Antenna about 1.4X length of forewing (n=1); scape without pecten, dark brown dorsally, white ventrally; pedicel coloured as scape; flagellum greyish brown dorsally, paler ventrally (whitish) almost until uniformly greyish brown apical flagellomeres. Haustellum well developed. Maxillary palpus porrect, white medially, greyish brown laterally. Labial palpus broadly curved, directed

almost straight anteriorly; second palpomere white medially, dark brown laterally; third palpomere white except for narrow dark brown line ventrally on whole length. Mesothorax dorsally cream-colored with some ochreous along middle, dark brown laterally; metathorax medially with thin cream-colored line, laterally and apically with shining greyish brown. Foreleg coxa pale brown with ochreous-bronze lustre; femur greyish brown with bronze lustre; tibia dark brown with cream medially; tarsomeres with alternating dark brown and white spots. Midleg femur greyish brown with ochreous basally; tibia dark brown with cream-colored patch medially; tarsomeres with alternating dark brown and white patches. Hindleg coxa with two white and two dark greyish brown bands; femur basally dark greyish brown, medially dirty white, apically pale brown; tibia greyish to greyish ochreous, becoming dark brown toward apex, with thin apical white line, with double row of stiff spinelike scales on dorsal margin; tarsomeres white with three diagonal dark brown bands in middle of tarsomere I, and junctions of tarsomeres I and II, and II and III. Forewing (Fig. 9) length: 4.5 mm (single male holotype); dark brown on basal  $3/5$  except for dorsal cream-colored band running from base until half wing length; with narrow, oblique, cream-colored streak outlined with single row of dark brown scales from  $3/5$  costa until  $3/4$  wing length above midline; area following streak, below, and on dorsal margin following cream-colored band chestnut brown until  $4/5$ ; with small white spot on costa at  $4/5$  connected with straight, narrow, transverse band of silver shining scales reaching dorsal margin; apical sector following silver band mostly chestnut brown with some dark brown towards costa and along dorsal margin, and white towards costa subapically; basal cream-colored band of dorsal margin ending in oblique pointed extension toward apex, followed by short and oblique chestnut brown band, followed by short cream-colored band along margin, followed by white spot before silver band; fringe along costa starting with white at position of silver band, followed by dark greyish brown, followed by smaller white spot subapically; fringe apically with three rows of scales: basal ones black with purplish lustre, medial ones longer and increasing in length towards M3, basally pale beige and apically dark brown, apical ones longer and apically brown; fringe on dorsal margin greyish brown with double row of wider chestnut brown scales and long and thin beige scales at base of silver band. Hindwing greyish brown with concolorous fringe. Abdomen dorsally greyish brown, ventrally mostly white, with five pairs of greyish brown stripes in diagonal laterally, also with cream-colored scaling at bases of last three pairs of stripes, most of penultimate segment medially, and all of last segment. Sternite VII (Fig. 18A) a very narrow sclerotised band laterally continuing on pleura and without associated scent scales. Tergite VII a lightly sclerotised and short (about  $1/4$  length of sternite VI) plate narrower than width of sternite VI. Sternite VIII a pair of narrow, thickly sclerotised rods set on each side, straight except for anteriorly pointing curve toward midline, associated at lateral ends with elongate plates of scent scales; scent scales bunch with some 75 elongate, curved, apically simple, and pointed or bifid scales, and some 10-15, short and rounded basal scales. Tergite VIII a large triangular plate with slightly convex lateral margins and rounded apex, about 1.4X length of tergite VI.

Male genitalia ( $n=2$ ) (Fig. 18). Tegumen narrow arms slightly curved, forming inverted elongate V, narrowly connected at pointed apex, almost reaching tips of





FIG. 31

*Gracilaria nolckeniella* Zeller, syntype labelled as Type.

valvae; also with narrow, well-sclerotised curved bridge from dorsobasal angles, reaching  $1/3$  length of arms. Vinculum arms greatly enlarged and extended dorsoposteriorly to  $2/5$  length of valva, laterally shaped like elongate triangles with rounded dorsoapical apices; ventral connection rather wide (about  $1/3$  length of dorsal margin of arms); saccus very narrow, long (about half length of vinculum arms). Subscaphium lightly sclerotised, reaching slightly beyond tegumen, without setation. Anellus membranous, with few short setae. Valva narrow at base, widening for  $2/5$  length along posteriorly extended arms of vinculum; dorsomedially at connection with vinculum arm with narrow rod extending anteriorly to almost anterior margin of vinculum; apical  $3/5$  with dorsal and ventral margins almost parallel sided, in continuation with margins of vinculum arms; apical margin forming about 45-degree angle from dorsal margin, apicoventral angle not projected nor with projecting short and thick setae; lateral surface slightly "extending beyond" median surface at apex in narrow and unsclerotised flange with short setae on apical margin; median surface mostly with short spinelike and pointed setae along outer margin and ventral margin on apical half, also with short hairlike setae along ventral margin toward base, and few moderately long hairlike setae subbasally along midline. Phallus about as long as valva, thin, slightly widened laterally near middle, with very short coecum penis; vesica with short area of scobinations.

FEMALE ( $n=3$ ). Forewing length: 3.9-4.2 mm. Antenna and colour as in male. Frenulum with 2 acanthae; secondary pseudofrenulum present, with 4 acanthae. Segment VI not different from precedents in size, tergum with sclerotised bar along apical margin. Female genitalia ( $n=1$ ) (Fig. 27). Papillae anales weakly sclerotised, not



FIGS 32-33

Larval damage of Galapagos Gracillariidae species. 32. *Caloptilia dondavisi* on *Rhynchosia minima* (L.) DC., (Leguminosae); 33. *Caloptilia cruzorum* on *Galactia* sp. (Leguminosae).

connected dorsally, shaped almost like isosceles triangles, with rounded apex, with mostly short setation along apical margin and few longer setae along narrow sclerotised bar of basal margin, also with microsetae. Posterior apophyses narrow for whole length although slightly enlarged basally and medially, twice as long as sclerotised basal margin of papillae anales. Segment VIII lightly sclerotised, more so and triangular at bases of anterior apophyses, long (about 3/4 length of segment VII), not connected ventrally; anterior apophyses basally narrow, with subsequent enlargement associated with short ventral arm, distal 3/5 narrow and straight, altogether 1.15X length of posterior apophyses. Antrum medially located along deeply emarginated apex of sternum VIII, at 2/3 of sternum length, forming thickly sclerotised short cup with narrower bottom; cuticle posterior antrum without perpendicular striae. Ductus bursae long, twice as long as segment VII, of medium girth, apparently unsclerotised (the sclerotised structures inside the ductus on Fig. 27 are part of a discarded spermatophore), only slightly enlarged distally, without scobination. Inception of ductus seminalis subbasally, ductus seminalis without associated large sac. Corpus bursae elongate, slightly shorter than ductus bursae, without distal bump, reaching into segment III, with subbasal pair of narrow and elongate low crests with associated small area of sclerotisation distally, without scobination.

**ETYMOLOGY:** From the Latin for brown, in reference to the ground colour of the forewing.

**BIOLOGY:** The specimens were collected during the day on coffee leaves as well as at night with ultraviolet light. The habitats where the moths were collected are in the agriculture zones.

**DISTRIBUTION:** Galapagos islands of San Cristobal and Santa Cruz.

**REMARKS:** The wing venation of this species varies a little from that of *N. gunniella* as provided by Davis *et al.* (1991). In the forewing of *N. brunnea* R5 and M1 are connate for half their length and M2 starts at the base of R5+M1; also, CuA2 is not connected to the cell.

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